THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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CANADA.

KNOWING something of the habit of mind of some men to-day, we can imagine a few of our trade readers exclaiming, not without a sign of impatience, as they observe the heading to this article: "Here's the REVIEW at it again! What is the use of talking to *us* about Canada?" Well, let us each settle for ourselves the matter of our relation to the trade of that vast territory, now in the fever-heat of development, but not without the ripest deliberation. If the reader knows all that there is to know about Canada let him kindly pass on to the next article—maybe there he will find something more to his liking, but if perchance he is still open to receive information, let him read at any rate these present notes to the very end.

We have written so much respecting the largeness of the opportunity across the Atlantic that it might be thought that we had little more to say, unless in repetition of the old story, but the subject is as inexhaustible as the resources of the great Dominion, and every man whom we meet after his journeyings across the thousands of miles that separate the Atlantic from the Pacific, sees something new and interesting, or sees something old in his own particular way, and thus furnishes new material for our assistance, either by way of encouragement or guidance. Some months ago we announced the departure of Mr. C. Hamilton Wickes from these shores, as H.M. Trade Commissioner to Canada and Newfoundland. Possessing an intimate knowledge of the value of the work done by him in the interests of British trade in Australia, we looked with eager expectation for information concerning his impressions formed in Canada. An emphatically strong man in more senses than one, a man of ripe experience and great determination, and knowing the difficulties which the Canadian market was alleged to present to the British manufacturer, he went to this great field with which he was already to some extent personally familiar, with a firm resolve to get at the bottom of things and do everything reasonably within the power and scope of a Government functionary to render the market more accessible to the Britisher. We have had the good fortune to cross his path this week, more or less accidentally, he being back in England for a brief holiday, and, naturally enough, we wanted to know what he had to say for our readers' enlightenment. In a few months one would hardly expect more than preliminary survey of the situation to have been made, but already Mr. Hamilton Wickes has left his impress where he has gone, and he has prepared material on questions of vital import to the future of British electrical trade, concerning which more, perhaps, in a later issue. Of course Mr. Wickes has not gone to Canada purely as an *electrical* representative—that is but one out of a hundred different industries whose interests he is out to foster, though the importance of electricity to the future of Canada and the reasonableness of the Mother Country in wanting to get her due share of the resultant busi-

ness would have amply justified his being sent even exclusively in that capacity. As we have said before, if the British Government were sufficiently alive to the importance of the matter, it would make a very generous vote to enable this matter of Trade Commissioners and Consuls to be dealt with in a most aggressive and complete manner. Fancy, one Commissioner to work the vast territories of Canada and Newfoundland on behalf of the British Board of Trade, and the entire British industries! To those of us who are thirsting for valuable information and keep a running stream of inquiries under the eyes of such officials, the position seems nothing short of ludicrous. How can the British electrical manufacturer expect to have prepared for him, and distributed to him in reasonable time, well-thought-out reports which will be of real assistance to him in his operations when those whom the Board of Trade sends out to perform these services find the activities of their office so circumscribed by financial considerations? One has only to imagine the great distances to be traversed in a colony of such vastness as that of Canada, to bear in mind the immense opportunity that there is now open for all departments of industrial development, the desire from our people at home for answers to queries, the high cost of living, and other such like factors in the situation, to feel that there should be an immediate allocation of many thousands of pounds a year, in order that the Trade Representative of the British nation may have at his command all the machinery, organisation and funds necessary to enable him to fulfil the manifold duties of his office without handicap and with maximum efficiency.

Returning, after this digression, to the impressions of Mr. Hamilton Wickes, we find him convinced, as the result of his present study of the position, that the trading opportunities in Canada are not utilised to anything like the full capacity by British manufacturers. Indeed, he goes further than this, and says the same with regard to our trade efforts in the United States. Some of our readers would as soon think of selling electrical goods at the North Pole as below the Canadian border line, but we know of a number of British electrical firms who have taken the trouble to try even the United States market, and they have got in to their satisfaction with their own special lines of goods. Mr. Wickes affirms that a high tariff does not form a sufficient wall to prevent our people from selling goods that the other people desire to have. He would hardly have had the temerity to mention it himself had he not first had representatives of American houses in England expressing to him their astonishment at the goods which they found made in the United Kingdom, and which they had bought and shipped to America within the last 12 months, and had sold at a profit. Mr. Wickes is anxious to direct our manufacturers' attention to the following aspect of the matter:—What are the imports into the United States of manufactured merchandise? What are the proportions shipped there by Germany, by France, by Italy, by Austria, and by the United Kingdom, of the article in the manufacture of which they are particularly interested? If the share of any of these other countries in a leading line exceeds that of Great Britain, is that a satisfactory position?—It is quite clear that if the tariff does not keep out the German and the Austrian trader neither should it keep out the British.

As may be gathered, one's pen may run away with one after only a brief vacation conversation with Mr. Wickes, and we must conclude this article with a reference to one other point concerning Canada. Are our consulting engineers so weighed down with work that they cannot spare time to consider whether there is any scope for their activities on the other side? Mr. Wickes's advice to them is to open branch offices there, and he supports that advice by pointing to the multiplicity of public water, sewerage, electrical, goods-handling and transportation, and other undertakings which are the problems of the hour in many parts of Canada, with its new and ever-growing cities and towns. We leave this seed in the fertile brains of gentlemen in Victoria Street and other members or non-members of the Association of Consulting Engineers.

Large Diesel Cylinders.

Some time ago there was an impression abroad that for some occult reason the cylinder of a Diesel engine could not have a diameter greater than 20 inches. Such a limitation could not arise, outside mere imagining, from any mechanical difficulty. The causes of the limiting diameter of the Diesel cylinder are, we believe, solely of a physical nature, and connected with the ignition and supply of the fuel. A given weight of fuel can be burned at a given centre. Any further weight of fuel at that one centre cannot meet the oxygen necessary for its combustion. To the lay mind two remedies suggest themselves. By one the fuel must be injected at more than one point, so that oxygen may be available for its complete combustion. By the other the fuel would be injected at a tangent to the circle of the cylinder, so that the incoming high-pressure air blast should set the compressed air charge in a whirl, and so expose the fuel to a sufficient proportion of air. The burning of the charge is a matter of time, and is not a sudden explosion like the burning of a mixed charge of gas and air. Is this time effect of such duration that the tangential method would meet the difficulty? These are matters for experts, who may have made all these experiments which suggest themselves. It can at least be rationally anticipated that there are no limits to the size to which the Diesel or any other internal-combustion engine can be made, unless we allow as a limit the largest machine tools that are available, or the largest lifting cranes. In its early days the gas engine was often granted very small sizes beyond which it could not be made. We never heard of any limits being set to the diameter of steam-engine cylinders. These have certainly been made 120 in. in diameter, if not more. That a 2,500-H.P. Diesel cylinder has been made already, is interesting, and it will be of greater interest when the fuel supply arrangements are available as general knowledge. It may well be asked, why should the Diesel or any heat engine have limits set to its dimensions? Indeed, would not a double fuel entry be particularly advantageous? In any new departure, it is at least better not too early to put limits on the extension that may be possible.

Competition at Buenos Ayres.

Although confirmation is not obtainable in Berlin administrative circles of the German Transmarine Electricity Co., it is reported from Buenos Ayres that the dispute with regard to lighting concessions in the Argentine capital is in a fair way of being adjusted. It is stated, for instance, that the Lacroze Tramway Co. is prepared to renounce the privileges granted by the National Government with regard to the supply of light and power in Buenos Ayres, of which details were given in this journal a few weeks ago, provided that the municipal council will confer upon the company an incontestable concession for supplying on the same conditions as prevail in the case of the German company. It is impossible to say what motives have prompted the Lacroze Co. to make a promise of this kind, unless it is desired to obviate the prospect of protracted legal proceedings through the interference of the National Government in the municipal affairs of the capital. At any rate, the municipal council is said to be agreeable to the offer made by the company, but the latter intends to maintain its special rights under the Government decree until the new concession is actually in its possession. When this has been obtained, the German company will be placed upon an equality with the Lacroze Co. and the Italo-Argentine Co., to which a lighting concession was also recently granted, and the supply business therefore is likely to be divided among the three undertakings in the future. The large area of the city and the enormous possibilities of expansion in the next 50 years, over which the concessions will or do extend, certainly afford scope for the activity of more than one individual enterprise.

BELT ACCIDENTS: THEIR BEARING UPON THE INDIVIDUAL ELECTRIC DRIVE.

By W. O. HORSNAILL, A.M.I.M.E., A.M.I.E.E.

A strong argument in favour of the individual electric drive for certain industries is afforded by the number of accidents arising from the putting-on of belts.

Where a number of independent machines, many of which stand idle for a week or more at a time, are driven through shafting, it is customary to keep all belts off except those of the machines which are actually in use. In fact, this is the only efficient method of driving through shafting, as the losses incurred by constantly running a large number of belts and loose pulleys through which power is only occasionally transmitted would be very considerable.

These conditions obtain especially in grain warehouses, where machines have to be maintained for the many kinds of cereals dealt in. The trade in foreign wheats, horse fodder, and so forth, varies a good deal with the seasons, hence certain machines may be idle for months at a time, and it is not uncommon to find some of them driven through a couple of countershafts, two or three belts, and perhaps a bevel gear. Fast and loose pulleys are obviously out of place under such conditions, the usual alternative being to take off the belts and stop all the driving gear until it is required. In cases such as these, a separate motor for each machine is undoubtedly the correct solution, both as regards economy and the absence of danger from the putting-on of belts when the machinery is running. That such belts will be put on without slowing down is abundantly evident to those acquainted with this industry, as, although a considerable number of accidents occur throughout the whole country, they are rare enough in individual cases to make the men careless.

Malting is another grain-handling industry where the machines are run under similar conditions, and a horrible accident recently happened in a large malting at Mistley, in Essex. In this instance a man was putting a belt for a large elevator on to a pulley running at 185 revolutions per minute. The floor was several inches deep in barley, and he had to stand on a stool about 3 ft. high to reach the pulley. In spite of a guard rail he was caught in the belt and his body was torn in two, one part being hurled through a window. In justice to the firm owning the malting, it may be said at once that every suggestion made by the factory inspector as regards fencing the machinery had been carried out, and it was actually possible to stop the shaft in question by fast and loose pulleys. The latter were, however, situated in another department, involving a walk of some distance to get at them, and to save this amount of trouble the man essayed to put on this large belt at full speed, as he had no doubt done successfully many times before.

There is very little doubt that the individual electric drive is the correct method for *new* grain warehouses and maltings, except as regards the ship elevator gear, as the latter, with its inside elevators and conveyors, forms an interdependent collection of machinery which is always running together.

The application of electric driving to *old* undertakings of this nature is a different proposition, as the shafting already exists, while in almost every case the capital expenditure is a serious item, and the installation of separate motors would be at once condemned on the score of excessive initial outlay.

In spite of this drawback, individual motors would probably pay for themselves in a year or two by the saving in power, particularly where old buildings are concerned. The weight carried in grain warehouses varies enormously according to the stock of grain, and old buildings always "give a little" according to the load, the result being heavy frictional losses in the shafting. Then again, shafting and belting involve a considerable amount of attention, together with occasional breakdowns which may entail costly delays, particularly when ships are waiting to be discharged.

The reduction in the cost of electrical apparatus—and we have not reached finality yet in this direction—is continually strengthening the case for the individual drive, and we may hope to see in time the entire elimination of accidents arising from the putting-on of belts.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Official Balance.

The writer had intended to ignore the childish gibes contained in "Representative's" last letter, but a desire to hold one's end up is a natural one, hence this trespassing once more upon your space.

"Representative" is singularly destitute of imagination. If a motor gets so saturated with moisture through standing in a compartment awash with water, for months—the writer never said the motor was immersed—that the task of getting up the insulation, owing to an exceptional combination of circumstances, becomes a long and difficult one, then, according to "Representative," it points to a "poor quality of insulation," or "exceptional carelessness" on the part of those in charge.

As a matter of cold fact, the erector in charge had agitated daily for several months to get the water removed, the only result being a bale out now and again, but nothing done to stop the water accumulating afresh.

The writer has never tried six coke fires in one unventilated compartment, and has no wish to. He had other reasons for not using coke, but space forbids. "Representative" might try to guess another reason, or he might go so far as to credit the writer with sufficient intelligence not to spend a sovereign upon prepared charcoal if a few pennyworths of coke would have done, or its use been allowed.

Respecting the head room, the writer, being a "careful engineer," duly measured this, and finding it a near thing, had no alternative but to attempt what he did. With regard to the tallow dip, if "Representative" has ever been "below" during "balancing," he must know that different circuits, sometimes all of them, are cut off for hours at a time while testing for, or picking up, faults. With regard to transporting the coils while hot, the writer duly covered them with sailcloth, but it was certainly not dry at the journey's end. Any dampness contracted in transit, or odd drops of rain getting on while the coils were being carried on board, quickly dried off before getting through the outer tape, thanks to the heat in the coils.

The gem of "Representative's" letter, however, is when he suggests blaming the dockyard people and insisting upon help being given, also his assertion that assistance is always given if trouble arises through ill-luck. This latter, as applied to dockyards, is the most amazing assertion the writer has ever heard. The suggestion to "blame the dockyard" is simply delicious. The writer once only, on his first ship, when very green, was going to blame the dockyard for something, but was providentially restrained by the erector, an old hand, with an extensive knowledge of dockyards. Now, Sir, the writer will, with your permission, give "Representative" the following challenge:—Will he carefully study the conditions under which the writer had to do the work, and say how he would have got the insulation up, or rather how much better he would have done it? The conditions were:—Six days to complete everything (two motors and two controllers), the parts not to be disconnected as the motors were required during the week. At the end of the week a few days more were given. Only after several false alarms being given about the ship's leaving was time given for stripping the motor. "Representative" must not assume at first that more time was going to be given later. No assistance from the dockyard was possible, even when the writer signed the usual requisition on behalf of his firm, undertaking to pay for such assistance, owing to shortage of men. No appliances were obtainable from the dockyard, even if paid for, owing to all available gear being in use. A limited amount of current only was available for running the motor—none at all after taking the armature out the first time. No coke or coal fires were allowed, owing to several seamen's hammocks being slung across the opening to the compartment, and, of course, as "Representative" says, no responsible engineer would burn charcoal. It took the writer a fortnight's hammering at the dockyard people to get the water stopped from entering the compartment.

D

Now if, after carefully reading the article again, and bearing all the conditions in mind, "Representative" will describe how much better he would have done the work, he will, no doubt, provide some more "amusing reading."

A.M.I.E.E.

[Regarding this instance of difficulty in meeting the official requirements, we are in possession of further particulars which it would not be to the interests of those concerned to publish, but which go to prove our contributor's contention that the case was one of exceptional complexity. Without a knowledge of these facts, criticism would be neither fair nor profitable; this correspondence, therefore, is now closed.—Eds. E.R.]

The Dangers of Termini.

In the case Hull Corporation *v.* Stickney, reported in this week's Electrical Review, the point in question appears to be which is the driver's platform and which the conductor's when a tramcar is stopped at a terminus? To my mind this is easily answered irrespective of the position the car occupies in the roadway. The driver's platform is that which has its exit on the off side and the conductor's that which allows the passengers to alight on the near side as close to the curb as possible.

Tramcars are already sufficiently dangerous in that they are unsteerable vehicles, and discharge their passengers in the roadway on the near side; drivers of other vehicles, however, are now used to this, but if passengers are to be allowed to alight from both ends of the cars chaos prevails.

The writer knows at least one terminus which is a positive death trap on Saturday and Sunday afternoons due to this and the heavy motor traffic, and no doubt when there has been a fatality or two this will be seen to.

The sooner the B. of T. Regulations are altered and enforced to give other road users a chance, the better.

F. Percy Seager.

Sheffield, *December 10th*, 1912.

The Institution of Electrical Engineers.

The suggestion of Mr. A. J. Abraham in your issue of December 13th that *all* engineers in charge should join the "Institution" and "shout for themselves," might appear at first to be a solution of the problem of getting chief engineers to pay a living wage to their engineers in charge of generating and sub-stations: but can anyone imagine employer and employé discussing questions of hours and wages at an Institution meeting? One might as well suggest that the directors of the railway companies should become active members of the Amalgamated Society of Railway Servants.

The question of hours and wages could only be *effectively* put forward by an Association to which employers could not belong.

Such an Association, as suggested by "Zantha" in your issue of November 22nd, could be formed, I know, in the eastern and northern districts of London; and it is proposed to make a start early in the New Year. It is not so much a matter of subscriptions, as of a little time and energy, devoted by a few men in the various districts, in obtaining members for such an Association. I should be pleased to hear from all those interested.

W. J. Ebben.

Stratford, E., *December 16th*, 1912.

Enough has been said by unfortunate sub-station men to show that we have a real *grievance*; take, for instance, "W.M.E.'s" letter in this week's issue. He says he knows of milkmen taking charge of a sub-station; they, I suppose, would be experts where "milking boosters" were installed, knowing so much about the dairy in their "apprenticeship" days. "Flashover's" letter is much to the point, and only goes to show, like most of the other letters, what a "rotten" state the electrical profession has deteriorated into.

I notice most of your correspondents are in favour of an "association of shift men," but, like myself, it is not advantageous for them to disclose their names. I know some submen myself who will join this association if this correspondence comes to anything.

No wonder so many young engineers go abroad when such a state of affairs exists at home. I know myself, personally, some who did so and who are getting on well now, where, as they say themselves, they get a fair chance of a living wage.

Booster.

During the past month I have been an interested reader of the various letters appearing in your valuable journal *re* the Institution and the conditions of sub-station engineers. Interested because I myself happen to be one of the "Unfortunate Individuals" alluded to by Mr. A. J. Abraham in last week's issue.

The pay is exceedingly bad, and I can vouch for the accuracy of "Motor-Generator's" reference to 5s. engineers. I know a yardman who has boasted to me on more than one occasion as to how he used to start up and synchronise in a traction sub-station some few years ago.

I believe that an association should be formed in the interests of sub-station engineers alone; but it must be approached very carefully, otherwise many men might be quietly dispensed with when it became known that they had joined.

"Flashover" has correctly stated that Trade Union principles are not applicable to station engineering. Therefore I hope the Association when formed (perhaps I am too optimistic) will not be based to any great extent on Union principles, some of which are decidedly bad.

During all this correspondence the consensus of opinion is that the Institution is of no advantage to young men; an opinion which I share, and believe it to be only a medium of social intercourse to its full and well-positioned members.

Surging.

I am heartily glad to see so many readers voicing their grievances as regards the salary paid to sub-station engineers, assistant engineers, &c., but I am sorry to see that there are other companies which employ 5s. a week engineers besides the particular company that I mentioned before.

Now the great cry is, "Why not form an Association?" How many have used that expression! yet, how many would be ready to give a helping hand? In my last letter I stated that I would do all in my power to help in the organisation of an Association, and I now guarantee that all the submen and assistant engineers in this town would join hands.

"Sub-Man" remarked in a letter appearing in a recent issue of the Review that he would be pleased to act as hon. secretary. I would ask "Sub-Man" to send his name and address to the Electrical Review offices endorsed "Motor-Generator," as I would like to have a word or two with him regarding the forming of an Association.

I propose that this Association be restricted to those actually doing shift work, or those in any way responsible for the running of a plant, *e.g.*, assistant engineers, sub-station engineers, switchboard attendants, or anyone who would be in any way capable of furthering the interests of this Association, to be called "The Electrical Shift Engineers' Association," the object being the furthering of a living wage cause, and to be recognised as a body of men of education and training; the Association not to be run on Trade Union principles. Then the I.E.E. could be approached for recognition of the Association, and, as practically all "chiefs" are M.I.E.E., our object would be attained. I wonder would it ever be possible for an Electrical Association to be as strongly united as the British Medical faculty are to-day? Let us only hope so.

Could any sane man expect a sub-station engineer or others in responsible positions to have the economical running of a station at heart when they have, perhaps, thousands of pounds' worth of machinery under their control, spending every day of the year in the station, including Sundays, Bank Holidays, and Christmas Day, for the princely salary of from 5s. to 20s. per week? What on earth will become of the young engineer 10 years hence?

Fellow sub-station engineers, assistant engineers, and switchboard attendants! I entreat you all once more to join

hands, be united, and strike one blow for this great cause, form an Association, refuse starvation wages, and let us all start the New Year with fresh hope and vigour, and "shut down" this sweating once for all!

I propose that every town in which reside more than 10 individuals who would be eligible for membership to the proposed Association should form a committee and hold a meeting, the names and addresses of members to be taken, with a nominal subscription. Let the head branch of this Association be formed in London (the reason being obvious), and let the names and addresses of outside branches be forwarded to the head. Canvass for members, and do not restrict the names to those actually in need of the Association, but include all those in the electrical profession who are likely to further the interests of the Association; this ought not to be very hard. I would like to see other proposals put forward.

I am sure we are all grateful to the Editors of the ELECTRICAL REVIEW for allowing us the use of these columns to voice our cause, and hope that they will leave them at our disposal for some time longer.

Motor Generator.

The Kelvin.

I read in a contemporary that as long ago as 1892 the Board of Trade attempted to persuade the industry to adopt the name of Kelvin for the outrageous unit called now a Board of Trade unit.

Many, I am sure, will be glad that this attempt has not succeeded, for if the name Kelvin is to be used for any unit, it must be adopted by general approval and not by coercive pressure, and for obvious reasons it must be international. How can we expect the logical mind of the Frenchman to accept the name Kelvin for a unit which is an odd number of a well-established unit?

We call the unit of work an erg, and as this is small (about one-thousandth of a gramme-centimetre), it is convenient to take 10 million of them, and call this new unit a joule. This is what we sell to the public, our predecessors having selected the coulomb and the volt such that their product equalled the mechanical unit of work (the joule). Our other units, the ampere, &c., are derived from these.

We, however, having been misled, selected 3,600,000 joules, and called it a Board of Trade unit or kilowatt-hour, but this is no reason for degrading the name Kelvin.

Why not go back and become logical, and call 10,000,000 joules 1 kelvin? We then get a simple decimal system:—

10,000,000 ergs, 1 joule.
10,000,000 joules, 1 kelvin.

The kelvin is then a mechanical as well as an electrical unit.

The effect in practice would be to convert a present price of 4d. per "unit" to 11d. per kelvin.

If there is any good reason, some other multiple of 10 could be used, but not an odd number.

Percy Good.

London, S.E., *December 14th*, 1912.

NOTES FROM INDIA.

[FROM OUR SPECIAL CORRESPONDENT.]

Nagpur.—The Nagpur Electric Lighting Co. has been started to provide the chief city of the Central Provinces with electric light and power. Work has already been commenced, and it is expected to have some of the engines and dynamos running by next hot season. The prospects of a good load are healthy, as all the new and old Government buildings are to be wired for fans and lights. An arrangement has been come to with the local Government, whereby a minimum load is guaranteed; this, together with the current required for 14 miles of street lighting, private bungalows, and railway yard lighting, should be a fair start. In time to come, the local cotton mills might be induced to buy power in bulk from the company. The machinery is to be provided by Messrs. Crompton & Co., who are the main contractors and local agents.

Delhi.—The Government of India is now gradually taking up its winter abode in the new capital, and the amount of electrical work which has been carried out departmentally during the past few months, reflects great credit on the engineers responsible for it. Many firms of contractors who felt that the work should have been put out to open tender have been disappointed that the authorities should have decided to do a good deal of it themselves departmentally; but the indefatigable electrical engineer has a will of his own, and knows best how to shape his own line of action in these matters.

Hooghly Side Mills.—A few very modern electric power drives are now to be seen in some of jute presses and flour mills on the Hooghly side. The earlier ones were 6,000-volt A.C. motors; but experience has taught that at this pressure insulation troubles, due to nitric acid and general dampness of the atmosphere (in the rains this latter is often 96° saturation) were numerous; it is now, therefore, the custom to transform down from the supply company voltage, 6,000 volts A.C. to 500 volts A.C.

Darjeeling.—This single-phase 83·3 ~ 220-volt hydraulic installation is one of the oldest in India, and its energetic engineer has boosted up its load very considerably within the last few years. The local tea gardens are finding it economical to install motors to drive their machinery now that wood fuel is becoming scarcer year by year. It is a difficult matter to get British motor builders and local agents to quote, for single-phase motors of the above strange periodicity. Some of them refuse point-blank to quote, others say they will "refer the matter home." There is at least one home firm, reminiscent of Tennyson, and whose picturesque and cheery advertisements adorn your pages, several of whose motors are dotted here and there through the tea fields, and are working successfully.

PROCEEDINGS OF INSTITUTIONS.

Overhead Transmission Systems.

AT Bristol, on December 9th, the WESTERN SECTION of the INSTITUTION OF ELECTRICAL ENGINEERS held their first meeting in that city. During the afternoon a number of the members were shown over the chocolate factories of Messrs. J. S. Fry & Sons, Ltd.

Following this a meeting was held in the University of Bristol, at the Merchant Venturers' Technical College, by the permission of Dr. J. Wertheimer. An address was given by Mr. T. Schontheil on "The Use and Design of Overhead Lines for the Transmission of Electric Power." As time went, he said, the necessity of being able to buy and sell electrical energy at as low a cost as possible would be of increasing moment. In that connection the cost of transmission was a very important item. In the construction of overhead transmission systems the question of wayleave played a very important part, and it would be seen that a compulsory modification of the veto possessed by local authorities and a modification of the present Board of Trade regulations would be desirable. In many respects this country was hampered in not having abundant water power to employ for generation purposes, and with that fact in view it was only reasonable to ask that further difficulties should not be placed in the way of power supply by fantastical arrangements of wayleaves. Dealing with transmission itself, wooden poles of Norway fir were chiefly used in this country, being creosoted with 10 lb. of oil per cubic foot of timber. Of all modes of preserving the timber against the ravages of damp and insects, creosoting was the most satisfactory, providing that the wood when treated was reasonably dry. For heavy lines A poles were preferable to singles poles. Careful tests showed that an A pole, properly scarfed and braced, would sustain a load in a direction across its two members nearly five times greater than would a single pole of the same diameter as one of the members of the A pole. A ratio of height to base of 8 to 1 for A poles, and a factor of safety of 10, with flexibility in the direction of the line, were desirable for all wooden poles.

Steel poles were usually constructed in tower form of either angles or tubes, as the main members, braced together in the form of a hollow square, by flat sections, which formed a lattice work. Such lattice poles were of good appearance and had great mechanical strength, together with a certain amount of flexibility. Owing to the difficulty of properly protecting them from corrosion with paint or other anti-corrosive material, they were open to considerable objection on that score.

In Italy and France iron poles of single channel section for straight

lines, and two-channel sections bolted together for strain poles were being largely used. Such poles possessed the advantage of being easy to handle, and easy to keep in good condition, besides being much cheaper than the lattice type. Tubular steel poles, owing to their cost and the difficulty of keeping the interior free from corrosion, were seldom used for transmission lines. In this respect it was quite likely that some of the older tramway systems would soon have either to replace many of the poles now in use, owing to their weakening by corrosion from the inside, or else fill the centres with reinforcing concrete. The reinforced concrete pole had not yet been used in England, but it seemed to have many points in its favour. It was easy to construct, and could, if necessary, be made on the site, with a consequent saving of the cost of transportation. At Oklahoma City, U.S.A., about a thousand concrete poles were in use for transmission lines. They were 30 ft. long, and hexagonal in section, with a hollow centre 16 in. in diameter at the base and 17 in. at the top, the walls being 2¾ in. thick. Running through each pole were 12 ¼-in. diameter twisted reinforcing rods at a tension of 11,000 lb. The weight of each pole was about 2,000 lb., and the cost $8.50. A mixture of one part cement, two of sand, and three of crushed stone, was employed in their manufacture. Another American concern, which had some 30 miles of high-voltage line, used poles 30 ft. high, 6 in. square at the top and 9 in. at the bottom. These poles were reinforced with six ½ in. square high carbon steel rods, extra short lengths being added to take the excessive strain near the ground.

The efficiency of any line depended chiefly on the ability of the insulators to withstand not only the conditions of service, but such increases of electrical and mechanical pressure as were likely to be met with. In this country, porcelain insulators were almost exclusively used.

An insulator, consisting of several units linked together and known as the suspension type, was coming into very general use for high-tension lines.

Of conductors there were only two metals commonly used, *i.e.*, copper and aluminium. Alloys of copper, such as phosphor bronze, were stronger, but were not as good conductors; whichever was used, the most important consideration was its strength. The factor of safety required by the Board of Trade, of ten, was much too high, one or two, or at most three, being ample for copper and aluminium lines, but no conductor should be smaller than No. 6 S.W.G. The respective merits of the two metals resolved itself mainly into a matter of cost, and aluminium seemed to have all in its favour, the present prices representing a saving of about 35 per cent. in favour of the latter. To secure a continuity of supply it was often deemed advisable to run double the number of transmission lines actually required, either on the same poles or on a duplicate set. In the majority of cases, however, one line was quite sufficient to serve as a stand-by.

The question of earthing was most important, but was too often neglected or done in as cheap a manner as possible.

Perhaps not the cheapest, but certainly the most reliable and efficient arrangement was to affix underneath the lowest cross-arm of each pole a small bracket carrying a reel insulator supporting a line of No. 8 gauge copper wire, this being run from one end of the line to the other. A similar-sized copper wire was fixed to project about 6 in. above each pole roof and then led down the pole backwards and forwards along each cross-arm, under each insulator pin collar, and so to the main earth wire, which should be properly grounded at each third pole.

Guard wires or cradles, when used to prevent lines falling to the ground, were often a source of danger, and it was far better to run an extra length of conductor on separate insulators, placed as close as possible to the others, over roadways and crossings. The end of the extra conductor to be extended well beyond the extreme width of the roadway or crossing and bound to the main conductor for a length of 4 ft. or so.

Accumulations of dust and dirt often gave rise to faults, and at pressures usual in this country. If the line ran near collieries or railway lines, it was advisable to have the insulators washed and wiped occasionally. Insulator pins were often a common source of weakness, and which could be guarded against by having them of ample strength. Wooden pins were useless, as they soon burned through. Weak binding was to be avoided as a frequent source of trouble. Of all the forms of wire clasps designed, none was equal to binding wire properly applied and of sufficient size. The great advantage of binding wire was that if a conductor broke, no insulator pins in the immediate vicinity of the fracture were damaged, the conductor being allowed to slip through its bindings.

A frequent cause of failure was due, not to any weakness, but a punctured insulator causing a partial leak, and so generating sufficient heat to burn the conductor through. In this respect a decided advantage could be gained by metal bands around the insulators to assist in dissipating the heat. Pole troubles were not numerous, but wooden poles, if not properly treated, were sometimes attacked with wet rot. Replacing such poles was a costly matter, and occasioned much inconvenience and loss, owing to the fact that the line had to be kept "dead" whilst the work was going on. A remedy of some value would be found in cementing the poles from the bottom to about 3 in. above the ground line, and leaving an annular space between pole and cement to about 5 in. below the ground line, the space to be filled with bitumen or a similar material. Another method of guarding against rot was, when the poles had become firmly set, to make an opening 4 in. to 5 in. wide round each pole to a depth of 3 or 4 ft., and into such hole pour concrete, tamping it well in and finishing off the top with an inclined watershed a few inches above the ground level. Such a method not only prevented water collecting around the base of the pole, but gave it a neat appearance. The lecture was illustrated by a number of photographs and line drawings, and examples of the different insulators.

The discussion that followed was carried on by Messrs. S. P. Walker, L. A. Hards, A. T. Kinsey and J. L. Wilson, and was adjourned to the next meeting of the Section.

The Generation and Distribution of Producer-Gas in South Staffordshire.

By H. A. Humphrey, M.Inst.C.E.

(*Abstract of paper read before the* Institution of Civil Engineers, *December 10th*, 1912.)

The South Staffordshire Mond Gas (Power and Heating) Co. is a pioneer undertaking, since it is the first example of a company giving under Parliamentary powers a supply of producer-gas for public purposes. The advantages of such a supply have now been amply demonstrated. The company's Act contains clauses prohibiting the sale of gas for domestic purposes or for illumination, and the limit of carbon monoxide in the gas distributed is fixed at a maximum of 14 per cent.

The area of supply comprises 123 sq. miles, within which there are six Corporations, 16 Urban District Councils, and three Rural District Councils. For the central station an area of about 40 acres of land, adjacent to railway and canal, was secured at Dudley Port, Tipton, which is practically the centre of gravity of the whole area. The designs of the central station plant and buildings, and the distribution system, were carried out by the author, as consulting engineer to the company, and the contract for the whole of the work was let to the Power Gas Corporation, Ltd.

The unit of plant adopted was based on a capacity for gasifying 140 tons of coal per day, and consisted of eight Mond gas producers, together with the necessary gas-cooling, cleaning, and compressing plant; plant for the recovery of sulphate of ammonia and tar; and the machinery, comprising steam boilers, circulating pumps, electric generating plant, motors, fans, &c. The first unit erected was started in operation in February, 1905, and at the present time additions are being made which will increase the output by about 80 per cent.

The supply to the public was commenced in May, 1905, and up to date there has not been a single stoppage of the gas supply from the station, the pressure being maintained in the trunk mains throughout the whole period.

For each ton of coal gasified, more than two tons of steam have to be blown into the producer with the air blast; most of this steam is generated by a recuperative system, and the remainder is derived from the exhaust of the engines and pumps about the works, which are driven by steam with this object in view. The boilers were originally of the "Climax" type, burning small coal with the aid of forced draught. At times when the demand for gas is small, the boilers are fired with gas. The Climax boilers are capable of generating steam quickly to meet a sudden demand, and have a very large grate area necessary to burn small fuel. The author devised a method for gas-firing without interference with the ordinary coal-firing. In order to prevent the deposit of scale on the boiler tubes, which are of a shape difficult to clean, the feed water had to be softened, and further purified by heating it to the full steam temperature, with the unexpected result that excessive priming resulted. As this could not be remedied, Lancashire boilers were substituted, with Bennis stokers and a simple but successful system of gas-firing. The latter gave a heat efficiency of 79·1 per cent.

The blowers are of the Roots type, driven by steam, as reliability is of the first importance, and work at a pressure of 28 in. water-gauge. An automatic device is used for controlling the pressure.

The producers are 10 ft. in diameter inside, of the Power Gas Co.'s standard type, with a special fuel-distributor which gives a level surface to the top of the bed of fuel. Each producer can gasify 20 tons of coal per day of 24 hours, or 30 tons on occasion. The ashes are drawn from the bottom of the producer through a water-lute once in eight hours. Over each producer is a large storage hopper holding 50 tons of fuel, as a measure of precaution against breakdown. The gas from the producers passes through superheaters to heat the incoming blast into the collecting mains, each of which receives the gas from four producers; it is delivered to the mechanical washer through an emergency valve. There are two washers, each fitted with three electrically-driven dashers throwing up large quantities of spray to cool the gas and wash out the solid particles of dust. Various cross-connecting pipes and by-pass valves are provided; for the 5 ft. 6 in. gas mains special valves have been designed, which can be operated in spite of deposits of tar and hard carbon.

From the washers the gas is led to the lead acid-towers, which are 14 ft. in diameter and 59 ft. high, and are filled with 4½-in. metalline ring tiles, over which the acidified liquid is distributed, meeting the ascending gas as it trickles downwards; the ammonia in the gas here combines with the sulphuric acid, forming sulphate of ammonia, which is allowed to remain in the solution until it accumulates to 40 per cent.

Next the gas passes through two or three cooling towers in series, 14 and 12 ft. in diameter and 57 ft. high. The hot water from the first tower is pumped to the top of the air-heating tower, which is 10 ft. in diameter and 57 ft. high, to heat and saturate the air from the blowers. The same water is returned to the first cooling tower. The water from the second tower is pumped to the top of a Worthington cooling-tower, of which two are installed, each 12 ft. in diameter and 40 ft. high, with forced draught produced by electrically-driven fans; the water is then returned to the second tower.

A third tower has been provided with an independent circulation of cooling-water.

Three electrically-driven fans with water injection are provided for cleaning the gas, which finally passes through six sawdust scrubbers in parallel, emerging with less than 0·5 gm. of tar per cubic metre of gas.

After passing through large rotary meters on the anemometer principle having a capacity of 500,000 cb. ft. per hour, the gas is compressed to 10 lb. per sq. inch by three steam-driven compressors for distribution. No storage is provided.

Two three-cylinder 250-H.P. Westinghouse gas engines driving dynamos supply current to the various motors, and for lighting the works. The exhaust from these passes through tubular boilers to reclaim some of the waste heat.

The liquid containing sulphate of ammonia is concentrated by evaporation until it crystallises out, when the superfluous liquor is drained off and the sulphate dried in electrically-driven centrifugal machines before it is bagged for sale. Both the annual consumption and the market price of the sulphate have been increasing during the past 10 years.

The majority of the machines run about six weeks continuously day and night before being stopped for examination. The acid towers run for two years continuously, and during the seven years of operation it has not been found necessary to change over the gas cooling and air-heating towers.

The tar collected from various parts of the plant contains 30 to 40 per cent. of water; before selling it, it is heated to 80° C., and stirred until it contains less than 10 per cent. of moisture.

The fuel used has an average calorific value of 11,600 B.TH.U. per lb., and the ashes contain about 10 per cent. of carbon. The Mond gas distributed averages over 150 B.TH.U. per cb. ft. with great regularity.

The gas is used by consumers in gas engines and furnaces, and practically every gas producer in the neighbourhood has been shut down; the price varies from 1½d. to 2¾d., according to the quantity supplied, the average price received being 1¾d. per 1,000 cb. ft.

There are 150 gas engines connected to the mains, aggregating 9,500 H.P., and for the last four years the Wednesbury Corporation has generated all its electricity by this means, at a works cost per unit generated lower than that of any other station having the same output. The original estimates for cost of production have been practically realised, though based on a very much larger plant. New plant is now in course of erection.

Institution of Electrical Engineers.

THE report of the Research Work Committee, which was adopted by the Council on December 12th, states that the Committee, in considering the scope and scale of the research work which might be undertaken by the Institution, is of opinion that it is desirable to avoid overlapping the work of other Societies, and therefore suggests that the work of the Institution be confined, as far as possible, to the following lines:—

(*a*) The organisation and correlation of research work in electrical engineering.

(*b*) The origination and supervision of specific researches in subjects connected with the electrical industry, and the allocation of grants in aid of the same.

The former should include: (1) The establishment of a General Committee for research, to which investigators would be invited to send particulars as to the subject and character of the researches they are undertaking. Members of the Institution, especially those connected with the manufacturing side of the industry, would also be invited to communicate to this Committee any special difficulties they had encountered which called for investigation, and to make suggestions for subjects for research. The General Committee would thus act as a species of "clearing house" for research topics, receiving suggestions from various sources, and sending them on after consideration to the most suitable quarters. (2) The collection and publication of particulars of plant available for special testing and investigation work in the various laboratories, together with a list of the subjects in which researches have been carried out. (3) The compilation and publication of bibliographies of specific fields of research.

With regard to the second heading, the Committee considers that it is desirable that the Institution should originate and direct researches in certain subjects, and suggests that the General Research Committee should have power to appoint sub-committees of experts to deal with researches in selected subjects.

In the first instance a series of investigations might be initiated on "The Electrical Properties of Materials," which would deal with such matters as:—Magnet steel, copper, carbon, paper, rubber, mica, porcelain, oils and varnishes, &c., for which fuller data are required.

Auction Sale: No Bids.—By order of the Receiver in the matter of C. & A. MUSKER, 1901, LTD., Messrs. G. N. Dixon and Co., of Liverpool, offered for public auction at Liverpool on Thursday, December 12th, the whole of the land, buildings, plant and machinery used by Messrs. C. & A. Musker, for the purposes of electrical and general engineering works at Tue Brook. The motive power plant embraced two Stockport gas engines of 120 and 95 H.P. supplied with gas from a bituminous gas-producer plant, and two Westinghouse generators of 85-KW. and 65-KW. capacity. The property was offered in one lot, and was withdrawn, there being no bids.

LEGAL.

THE DISTRIBUTION OF THE ASSETS OF THE NATIONAL TELEPHONE CO.

PENDING the award to be made by the Railway and Canal Commission in the proceedings between the National Telephone Co. and the Postmaster-General as a result of the taking over of the company's system by the Government, the Liquidator of the Telephone Co., Mr. George Franklin, applied in the Chancery Division this week to Mr. Justice Swinfen Eady asking his decision on certain questions as to the distribution of the assets.

MR. DANCKWERTS, K.C., who, with Mr. Percy Wheeler, appeared for the Liquidator, said the object of the summons was to get from his Lordship a decision upon certain points connected with the distribution of the surplus among the various classes of shareholders and stockholders. The surplus was used in two senses. First, in the sense of a surplus of assets over liabilities to outsiders, and secondly, in the present case it was used in the sense of surplus over liabilities and over the nominal capital returned to the various stock and shareholders. In the order which his Lordship might make counsel asked him to make it clear that he was dealing with the surplus of the assets of the company over the liabilities of the company to outsiders, and after adjustment of the accounts between the Postmaster-General and the company, and after the return to the stock and shareholders of the amount of the nominal capital, and the payment of the costs of the liquidation and arbitration. There were altogether five classes of shareholders and stockholders.

The first preference shareholders who had got a small holding, viz., £150,000, were represented by Mr. Butcher, K.C., and Mr. Cartmell.

The second preference shareholders also held £150,000, and they were represented by Mr. P. Ogden Lawrence, K.C., and Mr. Beebee.

The third preference shareholders held £1,250,000, and they were represented by Mr. Astbury, K.C., and Mr. Tomlin.

The preferred stockholders held £2,225,000, and were represented by Mr. Frank Russell, K.C., and Mr. Whinney.

The deferred stockholders held £3,725,000. They were represented by Sir Alfred Cripps, K.C., Mr. Younger, K.C., and Mr. Herbert Asquith.

The 3½ per cent. debenture stockholders amounting to £1,537,464, were paid off on January 29th last; the 4 per cent. debenture stockholders to the amount of £1,652,362, were paid off, with interest, on November 28th last. The capital of the first preference shareholders was paid off on March 1st; and of the second preference shareholders on April 3rd. Both first and second preference shares were £10 shares. The third preference shares were £5, and were paid off on July 31st last. The 6 per cent. preferred stockholders were also paid off on July 31st last. The total capital amounted to £10,683,780, including loans at the date of the winding-up in January last. The stock and share capital, without loans, amounted to £7,500,000.

His LORDSHIP: Is your short point this? All the debenture debt has been paid off, and all the capital repaid except £3,725,000 deferred stock.

MR. DANCKWERTS: That is so.

Continuing, Counsel described the position and nature of the National Telephone Co.'s business. The company, he said, ran a telephone system throughout the three kingdoms and the Isle of Man, and did so under a licence granted by the Postmaster-General, under which the company paid to the Postmaster-General 10 per cent. of their gross takings. The licence came to an end on December 31st last. In 1904 a contract had been made, subject to the sanction of Parliament, with the Postmaster-General, whereby, upon the expiration of the Telephone licence, he agreed to take over the whole of the plant of the company on an agreed sum, or, in default of agreement, the sum to be fixed by arbitration, the arbitral tribunal to be the Railway and Canal Commission. That arbitration had been going on for some months, and came to an end last week. A great number of items, amounting in value to some millions, had been agreed upon between the parties, and the remainder was dependent on the award of the Arbitration Court.

His LORDSHIP: What is the present position?—The figures have been agreed up to a certain amount.

MR. DANCKWERTS: Yes, upon certain parts of the claim.

His LORDSHIP: How much has come to the company as regards agreed figures?

MR. DANCKWERTS: Between two and three millions.

His LORDSHIP: Has the Liquidator exhausted the assets already received?

MR. DANCKWERTS: We have had payments on account.

His LORDSHIP: But has the liquidator exhausted what he has received?

MR. DANCKWERTS: Nearly.

His LORDSHIP: So that if that were all that were to come, and if the claimants did not succeed upon any of the disputed items—

Mr. DANCKWERTS: Which is out of the question.

His LORDSHIP: True, but in such case there would not be sufficient to pay the deferred stockholders?

Mr. DANCKWERTS: Yes

In answer to further questions by his Lordship, counsel said the claim, over and above some two or three millions representing agreed figures, was £18,000,000. They had received £7,000,000 on account. The original capital of the company was £600,000, divided into 5,000 preference shares of £10 each, and 90,000 ordinary shares o

£5 each. The ordinary shares formed part of the deferred and preferred stock of the company.

His Lordship asked if the whole of the National Telephone Co.'s business had gone; it did not continue on any restricted lines?

Mr. Danckwerts said it could not do that; everything had been handed over to the Postmaster-General. The company had also sold a private wire business.

His Lordship: That was what was in my mind when I asked the question. I did not know whether they were entitled to continue in that business?

Mr. Danckwerts replied that that was not so; everything had been taken over by the Postmaster-General.

Mr. Butcher, K.C., on behalf of the first preference shareholders, claimed that his clients were entitled to share the surplus assets of the company rateably with the other classes of shareholders. They were entitled to 5 per cent. cumulative dividend out of profits upon the whole of the paid-up capital, and they got their preference dividend down to December 31st, 1911. There was a sum of profits available to pay them not only down to that time, but down to March, 1912, when the nominal amount of capital was paid off. He asked his Lordship to say that they were entitled to interest on dividends down to this latter date. He based his claim on the original articles of the company and on the rights conferred by those articles, and he asked his Lordship to say, as regarded the articles, their rights were specially preserved.

Mr. Cartmell followed also on behalf of the first preference shareholders.

Mr. Ogden Lawrence, on behalf of the second preference shareholders, first combated the contention put forward by Mr. Butcher—that the first preference shareholders were entitled to any anticipation in the surplus assets. Secondly, he submitted that his clients were entitled to anticipation in the assets. The extent to which they were entitled was the extent which their capital bore to the capital of the deferred stockholders, plus the amount the preferred stockholders would get under a splitting resolution of 1901. In other words, they were entitled under that resolution to a certain portion of the surplus assets in respect of preferred stock created by that resolution, but not to any suplus profits in respect of future preferred stock issued.

His Lordship asked counsel what attitude he took up with regard to the third preference stock.

Mr. Lawrence said he was in some difficulty with regard to dealing with that class of stockholder until he had heard what the learned counsel appearing for them had to say.

His Lordship: And as to the others?

Mr. Lawrence said with regard to the £3,725,000 deferred stock, he admitted the whole of that would share the surplus assets, but with regard to the £2,225,000 of preferred stock, that would only share to the extent of £1,000,000 under the splitting resolution of 1901.

Mr. Astbury said he appeared for the third preference shareholders, and he opposed Mr. Lawrence's claim, and submitted the claim of the first preference shareholders was also a bad one. It was clear that the latter were entitled to their 6 per cent. out of the annual distribution, and to have their capital back on a final distribution. Beyond that they were entitled to nothing. The articles clearly provided that the excess capital was to be distributed among members of the company other than the first and second preference shareholders. The assets should be more than sufficient to repay the whole of the paid-up capital, outside liabilities, &c. Then the excess should be distributed among the members in proportion to capital paid other than the first and second preference shares.

His Lordship said that the only two figures apparently which were material were the £1,225,000 third preference shares rateably with £4,950,000 stock.

Mr. Astbury said that was so.

Mr. Tomlin, for the third preference shareholders, argued that on the true construction of Article 126, the first and second preference shareholders were expressly excluded from participating in the excess.

His Lordship pointed out that there was no special term entitling the third preference shareholders to participate.

Mr. Tomlin said they based their case on a decision given by his Lordship in another action.

Mr. Russell, K.C., on behalf of the preferred stockholders, said his claim was twofold. First, he claimed interest; and, secondly, he claimed to be entitled to share in the surplus assets. As regarded the first, the business was sold on December 31st, 1911, but his clients were not paid off until July 31st, 1912. The payment of the purchase-money, for the convenience of the purchase, was postponed, but on the terms of interest in respect of the postponed purchase-money. With regard to the right of the preferred stockholders to share in the surplus assets, he realised he must get to the right side of the door before he shut it in the face of other people. There would be a very substantial sum to divide by way of the surplus assets. If that were not so, they would not be before his Lordship in such large numbers. Since the splitting resolution the preferred stockholders had received their 6 per cent., and the deferred stockholders had also received 6 per cent., but between 1901 and 1907 the dividend varied, and did not reach 6 per cent. He conceded that in the division the deferred stockholders should receive a sufficient sum to level them up to the preferred stockholder in the way of dividends and business.

Mr. Younger, on behalf of the deferred stockholders, said it was his duty to resist all the attacks which had been made from every quarter. The surplus assets ought not to be diminished by the payment of any interest or dividend on any of the stock or shares of the stockholders.

(To be continued.)

Petition by British Westinghouse Electric and Manufacturing Co., Ltd.

The petition by the British Westinghouse Co. for the compulsory winding up of the Garnant Anthracite Collieries was again before Mr. Justice Neville in the Companies' Court on Tuesday last.

The petition had been standing over since December 3rd with a view to an arrangement being come to, and his Lordship now, with the consent of all parties, adjourned it until the first petition day in the next sittings.

Hampton & Sons, Ltd., *v.* Princess Annie de Lusignan.

A claim for electrical fittings by plaintiffs, of Pall Mall East, S.W., was heard in the Official Referee's Court before Mr. Verey, against Princess Annie de Lusignan to recover £162 5s. 11d., for decorative and electrical work done in her flat at 11, Wellington Court, Knightsbridge, S.W., last year.

Mr. Frank Mellor, for the plaintiffs, said the flat was on the fifth floor, the kitchen and domestic offices being on the floor above. Most of the work was in respect of the fifth floor.

The defence was apparently an allegation that the work was negligently and unskilfully done, and that £100 which was tendered was sufficient payment.

Counsel said that from the first the plaintiffs had taken up the position that if anything had been defective they should have been allowed to put it right, but the defendant had never given them that opportunity.

Matthew Greenwell, electrician in the plaintiffs' employ, said they altered existing wires, and did work in respect to counter-weight fittings. They rewired pendants and refixed bell pushes. Some of this witness did with his own hands. He also supervised men in the employ of Messrs. Hampton in their electrical department.

After evidence for the defence, the Official Referee said that, on the whole, he came to the conclusion that the plaintiffs had carried out the work specified, and, taken on the whole, in a proper manner. The plaintiffs had been ready and willing at all times to put right whatever small defects there might be, if only they had been allowed, and he thought that the defendant, in not giving them access, had taken a rather unreasonable attitude. He thought that £2 5s. 11s. should be allowed for the cost of making good these little things to complete the work. There would, therefore, be judgment for the plaintiffs for £160 and costs.

Motor-car Accident: Damages.

At Durham County Court on the 16th inst., before Judge Bonsey, Joseph Cooper was awarded £50 as damages for injuries received through being knocked down by a motor-car belonging to the County of Durham Electrical Distribution Co. It was agreed that the damages, if any, should be assessed at £50, and the question before the Court was one of liability only. This was decided in plaintiff's favour, with costs.

The Earthing of a Switchbox: Appeal.

In the King's Bench Divisional Court on Monday, the Lord Chief Justice, and Justices Coleridge and Rowlatt, heard the appeal of Mr. John Atkinson, Inspector of Mines, against the decision of the Gateshead Justices, who had refused to convict Mr. Henry M. Imrie, the manager of the Chopwell Colliery, Gateshead, for an alleged offence under the Coal Mines Regulation Act.

Counsel, who appeared on behalf of the appellant, said Mr. Imrie was summoned at the instance of the Inspector for neglecting to have an electric switchbox earthed, which was contrary to the regulations of the Act. The justices, however, declined to convict, holding that an offence had not been committed. The whole question turned, said counsel, on the meaning of the word "construction." It appeared that the switch in question was used for controlling a portable electric motor, which worked a conveyor for carrying coal. The box was not properly earthed, and last May, while it was out of order, a workman touching it was killed by an electric shock. If the switchbox had been in proper order and earthed, this would not have happened. The box in question was constructed before 1911, and to earth it, it would be necessary to carry a new cable to the surface. His contention was that it constituted an installation, but it was the respondent's argument that it was covered by the word construction, and that he was shielded by the special rules of the Act, which did not come into force until 1920, and which provided for the earthing of all electrical apparatus in mines after that date, and exempted all apparatus constructed before 1911. Counsel contended that the plant in question could easily have been earthed by "placing a piece of copper wire around it and sticking it into the earth," and that the respondent had been guilty of an offence.

Counsel for the respondent said the justices dealt with the question very carefully, they saw the plant, and had it described to them, and they decided that earthing the switchbox would come within the meaning of construction, and that, therefore, the respondent was protected by the special rules. In this case he did not fight the matter on the ground of expense, but in some mines, where they had not an armoured cable, the expense of earthing the electrical plant would be enormous, because cables would have to be taken the whole length of the mine. The special rules dealing with the construction of electrical plant in mines had been made enforceable in 1920, so that some of the old plant would become worn out before the colliery owners were bound by law to

incur the expense of earthing, and to give them an opportunity of purchasing new machinery. In the present case, seeing a new cable would have to be laid down, he argued that it was a part of the construction, and he was therefore protected by the special rules.

Their Lordships reserved judgment.

The Telephone Arbitration.

(*Concluded from page* 952.)

Continuing his summing up of the case for the company, Sir Alfred Cripps dealt with the question of plant depreciation, which he described as a most important part of the case, and which he said required very careful consideration. According to the estimate of the Post Office, the value of the plant when new was £12,000,000, and by its method of calculation, the figure of £7,000,000 was arrived at, after allowing for depreciation. In considering this figure, he submitted that the Court must have regard to the life of the plant, and by that phrase he meant the period of time for which the plant could be efficiently used, after eliminating the human element and changing conditions consequent on changing business. That was the basis Mr. Gill, engineer-in-chief to the National Telephone Co., enunciated at the start. On the other hand, the Post Office had taken as its basis, what was called effective life, the period of efficient user diminished by changes brought about for business reasons. He contended that the basis adopted by the company was the correct one, and that the figure arrived at by the Post Office for deductions in respect of depreciation was simply ludicrous. The Court must eschew from their minds any notion that they were valuing second-hand plant. They had to ascertain what was the proper cost of construction and the proper amount to deduct in respect of depreciation. The plant had to be valued on the basis that it was established and ready to earn a profit. Although they had nothing to do with the business element they had none the less to bear in mind that they were valuing the plant as a going concern. As to the cost of raising capital, the company claimed that it was entitled to the cost of buying the capital used in connection with the construction of the plant. The arrangement between the Post Office and the company was that the latter should be paid in Exchequer bonds terminable in 18 years. He wished to point out that when the company received some of these bonds a short time ago they were only able to get £92 6s. for £100 bond. That meant 7 per cent. discount on any sum the Court awarded the company.

Sir Jas. Woodhouse asked if counsel suggested that that 7 per cent. was a charge the company were entitled to make.

Sir A. Cripps said he did not, but he simply mentioned the fact to show what the company had to pay.

Sir J. Woodhouse: Do you limit the claim to brokerage and commission?

Sir A. Cripps: That is so.

Concluding his speech, Counsel said: The company have neither asked for nor given any quarter. They ask for nothing more than fair treatment, and I am confident that this Court will give them nothing less.

The Solicitor-General, dealing with the question of the cost of raising capital to construct the plant of the company, submitted that that was an expenditure which should not be added to the charge for the plant.

Mr. Justice Lawrence asked if it were not conceivable that plant of some £10,000,000 in value could not be constructed without expense having been incurred in raising capital.

The Solicitor-General: I submit, my Lord, that before a man can hope to pay for a thing, he must first take the necessary steps to find the money.

Sir A. Cripps said he was only entitled to what was necessary as an element of cost in raising capital. He did not suggest he should receive more under that head.

This brought the proceedings to a close, the arbitration having occupied 71 days.

The Commissioners, of course, reserved their judgment. No announcement was made as to when the Court would sit again to deliver its verdict.

British Economical Lamp Co., Ltd., *v.* Empire, Mile End, Ltd.

In the Lord Mayor's Court, before the Recorder (Sir Forrest Fulton, K.C.) on Friday last, plaintiffs, of Old Bailey, E.C., sued the defendants and Mr. Alexander Bernstein, of 140, Fenchurch Street, E.C., the managing director and largest shareholder in the company (a picture palace concern), to recover 1,099 electric lamps or the sum of £135 10s. 11d., their value. Mr. S. Mayer was counsel for the plaintiffs, while the defendants were represented by Mr. Rankin.

Mr. Mayer stated that the defendants were the lessors of a theatre in the Mile End Road, and apparently they let the building to a concern known as the Yiddish Opera and Operetta Co. The latter found that the electric lamps in the theatre were not suitable for them, and they applied to the plaintiffs for fresh metal-filament lamps. In all, the plaintiffs supplied 1,099 electric lamps, of which 846 were metal-filament lamps at 3s. each, 250 carbon lamps and 300-c.p. lamps. Those lamps were not sold, but were let to the Opera Co., under an agreement at £3 a week. The plaintiffs had never succeeded in getting any of that money. Unfortunately the plaintiffs also supplied new fittings for the theatre, but as those were sold they could not claim for them from the defendants. So far as the lamps were concerned, they were let to the Opera Co. on September 13th last., and by October 5th, as nothing had been secured, an application was made for payment. They were then informed by the manager that he had closed the theatre, but hoped to open again very shortly. Subsequently it was found that Mr. Bernstein, the manager of the defendant company, was in possession. He said that he was the landlord, and everything was forfeited to him. The defendants had taken possession, as the Opera Co. had not paid the rent of the theatre. Correspondence then ensued between the solicitors to the parties, and the defendants' solicitors stated that the lamps were fixtures, and could not be removed after the tenancy of the Opera Co. had been determined. The defendants offered to allow the lamps to be removed on certain conditions, but the plaintiffs did not see fit to accept that offer, and therefore proceeded with the present action. In the defence which had been filed, the defendants said that when they let the premises they contained certain lamps which belonged to them, and which were affixed to the building. That, declared Mr. Mayer, could not be true, as an electric lamp was never affixed to premises. The defendants further admitted that they entered into possession of the theatre and determined the lease in October last, as the rent had not been paid. The defendants set up that if the lamps claimed were in the theatre, then they had been affixed to, and become part of, the premises, and were now their property. Counsel added that the worst feature of the case was that the defendants had been running the theatre as a picture palace with the plaintiffs' lamps, and, doubtless, making a good thing out of it.

Evidence was given by Mr. Charles Butfield, an inspector in the employ of the plaintiffs, who said that the defendants were being sued for 3s. for each of the metallic-filament lamps, although it had been agreed that the Opera Co. should only pay 1s. 9d. for each of the lamps which were broken. The witness declared that there was a ring in existence which kept up the prices of metallic-filament lamps. His firm supplied metallic-filament lamps which were made in this country. They were better than the German lamps imported into this country, but he declined to say who the manufacturers of the lamps were or where they were manufactured.

On behalf of the defendants, it was urged that the lamps were tenant's fixtures and not landlord's fixtures. As the lease was forfeited the tenant could not expect to take the lamps away.

Mr. Mayer said that no distinctions could be made between a landlord's and a tenant's fixtures. The sole question was whether the lamps were fixtures, and the plaintiffs claimed that they were not.

The Recorder: If they are fixtures you cannot claim them?

Mr. Mayer: That is so.

Mr. Rankin said that if the lamps were chattels and not fixtures then the trade of the plaintiffs would probably be ruined. If the lamps were chattels, and not fixtures a distress could have been put in immediately the rent was in arrears, and the lamps distrained upon.

Mr. Mayer: Before the Law of Distress Act of 1908 you could have done so.

Mr. Rankin further stated that when the defendants let the premises they were fitted with electric lamps, which had been removed, and those supplied by the plaintiffs were substituted.

After hearing further legal argument, the Recorder held that the lamps were trade fixtures, and entered judgment for the defendants with costs.

Leave to appeal was applied for and granted, and a stay of execution granted on the usual terms.

BUSINESS NOTES.

Trade Announcements.—Last week we had the pleasure of going over the very fine premises into which Messrs. Krupka & Jacoby, Ltd., have removed at 26-36, Chapter Street, Westminster. The buildings cover a very large area, with most extensive office and storeroom accommodation, and since their purchase by the firm, have been transformed and generally adapted for the purposes of the business at large expenditure, and in very fine style. When the transformation is perfectly complete—a number of finishing touches were being given at the time of our visit—and the stock is well displayed and stored, with the staff accommodated in bright and comfortable surroundings, there will still remain ample room for further extensions, which it is expected will be necessary as a result of the firm's policy of commercial expansion. At present the buildings are two-storied with flat roofs, so that new floors can easily be added. The Graetzin metal-filament lamp is, of course, used throughout for lighting, and much of the store accommodation will be devoted to keeping large stocks of these lamps, in sizes from 16 to 1,000 c.p. for high voltage. The wiring is effected in screwed conduit, and a 20-line Sterling intercommunication system of telephones serves all departments. In addition to Graetzin lamps, the stocks to be carried will include carbon brushes, cables, and general electrical accessories.

The Armorduct Manufacturing Co., Ltd., announce that their agency arrangement with Mr. H. B. Done has come to an end; the Midland business will in future be handled by Mr. A. H. Broadribb, who has been connected with the company for a number of years. Mr. Broadribb will make his headquarters at the firm's Witton works as from January 1st next, when correspondence should be addressed to the company there. Until that date letters should be sent to Farringdon Avenue, E.C.

Mr. W. S. Wilson, electrical engineer, of Watford, has removed his business from High Street to larger premises in Water Lane.

Messrs. W. V. Waite & Co., Ltd., announce that their address,

from January 1st next, will be Alpha Works, Taffs Well, Glam., where they have taken more convenient premises, and will extend their business along additional lines.

Messrs. Watlington & Co., Ltd., announce that from Christmas all communications should be addressed to them at their new premises at Britannia House, 48, Milton Street, London, E.C.

Germany's Electrical Exports.—During the autumn of this year, says *Elektrotechnik und Maschinenbau*, the exports of the German electrotechnical industry underwent a remarkable expansion. While in September, 1911, the deliveries of electrotechnical products abroad totalled 86,953 quintals, in the same month this year the figures rose to 102,106 quintals. In the period from January to September the progress was also evenly sustained, reaching a total of 808,620 quintals, or an advance of 54 698 quintals, on the amount for the previous year's corresponding period. In the values of the exports the progress was illustrated by the difference between the figures for the current year of 161·8 million marks, and those for last year, namely, 154·23 million marks, and this improvement was effected notwithstanding that the most important articles of export hitherto—viz., cables—showed a considerable retrogression. Exports of these latter articles in the first three-quarters of the preceding year were 286,813 quintals, against 260,690 quintals in the current year. The cause of this decline is not so much the lesser exports abroad, as the shrinkage in the shipments of submarine cables, which, in the first 10 months of last year, were exported to the extent of 59,835 quintals, while this year the figures fell to 13,814 quintals. Contrasted with Swiss exports of dynamos, which, in the first half of the current year, showed a falling off in both quantity and value, German exports of these goods in the first eight months registered steady improvement. The January to August figures for the last six years in double centners make the following showing:—1907, 468,341; 1908, 532,829; 1909, 491,284; 1910, 569,394; 1911, 666,969; and 1912, 706,407. How quickly the German electrical industry has recovered from the evil effects of the 1907 year of depression is shown by the fact that in that year Germany's exports of all kinds of electrical goods aggregated 108·67 million marks, whereas in the current year the figures were 141·04 million marks. Compared with last year, there is, too, an increase of 4·35 million marks. As regards the export of individual articles, advance was most noticeable in small dynamos, motors and transformers. These were shipped in the eight months to oversea markets to a total of 63,920 quintals, against 53,305 quintals in the corresponding period, their values also rising from 11·36 million marks to 12·85 million marks. Austria was the chief purchaser and took 10,637 quintals, against 8,563 quintals last year. The exports of large dynamos, motors, &c., of above 5 quintals in weight failed to maintain the height of the previous year, the figures being 146,641 quintals, against 158,997 in the same period last year. Values also declined from 19·36 million marks to 17·66 million marks. Shipments to particular countries, however, showed numerous increases. Thus, Italy took 17·62 million marks' worth, against 14·34 million in the preceding period; Belgium, 10,723 quintals, compared with 7,504; and the shipments to Argentina rose from 9,693 to 17,453 quintals. Notwithstanding general trade shrinkage, exports to Japan attained the figure of 18,824 quintals. Complete armatures and commutators were shipped in the first eight months of the year to the extent of 26,018 quintals, representing a value of 3·98 million marks. Important purchasers were likewise Italy and Great Britain. The export of electric cable in this period under review amounted to 228,778 quintals, the relative money worth being 17·04 million marks. Holland took 35,081 quintals, or 8,357 more than in the eight months of the foregoing year; the exports to Japan rose from 33,441 quintals to 34,160. Taking third place, Argentina was a purchaser to the extent of 29,179 quintals, or 3,792 more than in the previous year In Europe, Sweden took 24,499 quintals and Belgium 24,407 quintals. Lastly, fittings for lighting and power transmission, &c., were exported in steadily growing volume, the figures being 71,989 quintals last year, against 91,429 from January to August in the current year. Values likewise increased from 19·76 to 24·37 million marks. Russia, Austria and Argentina were takers together of about half of the total of Germany's exports.—*Elektrotechnik und Maschinenbau.*

The Advertising Exhibition.—This Exhibition was held at the Horticultural Hall, Westminster, during last week. The Horticultural Hall certainly does not lend itself to the exhibition of large electric signs, but there are innumerable small electric flash and transparency signs for external and window use, and why more of these were not exhibited must remain a mystery. Broadly speaking, not a single electrical advertising device received adequate representation, though honourable exception must be made in the case of the British Electrical Federation, the activities of which are, however, chiefly concerned with tramcar advertising. The Federation is able, by its association with the electricity supply undertakings in 24 districts, to offer specially favourable terms for the supply and maintenance of electric signs of any kind, but the exhibits shown were practically confined to improved styles of plates for advertisements on tramcar and other vehicles, and to transparency and rocker signs for the same purpose. The transparencies shown included "orograph" plates for use in the back of destination boxes and small panels for use in place of ordinary shades over the other lamps used to illuminate tramcars. In both cases the advertising sign is as effective by day as by night, and since the artificial light employed by night has necessarily to be provided for other purposes, the rental for these signs is actually lower than the cost of the energy consumed in the lamps.

The rocker sign mentioned is constructed under Huckle's patent, and employs a 6-in., eight-spoked star wheel to oscillate an indicator or disk device in any appropriate advertising sign. The star wheel is actuated by a metal ball rolling to and fro in a runway (as the vehicle oscillates), and displacing, in one direction or the other, the vanes of the wheel, which reach into its path of motion. The mechanism is the acme of simplicity and strength, and the driving force, being that of gravity, costs nothing.

Numerous examples of electric sign transparencies—offering considerable advantage over earlier types as regards artistic effects and durability—were shown by the Orograph Process Co. In all the exhibits including transparency signs, appreciation was shown of the fact that "spot" effects must be avoided—by the use of reflected illumination or by placing the lamps at a suitable distance behind the transparency, with the interposition of diffusing screens if necessary. The arrangement of the illumination with regard to the subject of the transparency also showed a marked advance on what is, even now, very common practice on users' premises. It is, of course, essential for good effect that lamps should be placed behind the high lights of the design or, in other words, the artificial illumination should be from that direction which is assumed by the artist in designing the sign.

It is to be hoped that, at the next Advertising Exhibition, electrical activity in this field will be adequately represented. Apart from electric signs proper, pertinent lines for exhibition in the recent show would have been various types of flasher motors and controllers, electric motors for use with multigraphing machines, display light fittings for electrical publicity.

Sheffield.—Messrs. Thos. A. Ashton, Ltd., have just secured the following contracts for electrical work in the Sheffield district:—Penistone Road destructor, lighting; Corporation Street baths, lighting and bells; Yorkshire Garage Co., garage and body building shop, light, power and telephones; Swinton U.D.C., water-level indicating system between reservoir and pumping station.

Christmas Holidays.—The Cable Accessories Co., Ltd., of Britannia Street Works, Tividale, announce that their works will be closed until the Monday morning following Christmas.

The Midland Electric Manufacturing Co., Ltd., Rea Street South, Birmingham, announce that their works will be closed from noon on Tuesday next, December 24th, until the morning of Wednesday, January 1st, for stocktaking. A small office staff will attend to urgent correspondence.

Bankruptcy Proceedings.—Samuel Lord, director of a limited company, 18, James Street, Liverpool.—The first meeting of creditors in this matter was held at the offices of the Official Receiver, Union Marine Buildings, 11, Dale Street, Liverpool, last week, when it was reported that the receiving order was made on the debtor's own petition, and according to the statement of affairs the liabilities amounted to £3,338, and were made up of the claims of unsecured creditors, £1,190, three contingent liabilities of £2,144, the whole of which were expected to rank for dividend, and preferential claims for £4. The assets consisted of a watch, chain and two rings, valued at £2, and one fully paid-up £1 share in the Lord Howe Electrical Engineering Co., Ltd., valued at 10s., making a total of £2 10s. The failure was attributed to the difficulties of the firm of the Howe Electrical Engineering Co., which had been caused by bad trade, bad debts, and losses on contracts. The debtor stated that he was employed as managing director of an Electrical Engineering Co. at a salary of £3 a week; and about 18 years ago he was admitted into a partnership with two others under the style of the Howe Electrical Engineering Co., paying £600 into the partnership, which sum he borrowed on the security of his reversionary interest in his father's estate, the loan being repaid on his mother's death, when the estate was distributed. About 15 years ago one of the partners retired, and the debtor continued the business at Redcross Street, Liverpool, with Mr. Wesley Sutton, the other partner, when a Mr. J. W. Garsden was admitted into partnership, and a branch was opened at Blackburn. In September, 1909, the partnership assets, with the exception of book debts, were sold to a company called the Howe Electrical Engineering Co., Ltd., for £1,200 in cash, and £2,400 in shares, the partnership liabilities not being taken over by the company. On October 30th, 1909, the debtor and Mr. Garsden paid Mr. Sutton £100 on the dissolution of the partnership, and in the deed of dissolution they agreed to indemnify him against all liabilities. The company only lasted until February, 1911, when it was voluntarily liquidated, part of the assets being acquired by a new company, in the employment of which the debtor was at present. The debtor stated that the whole of the cash consideration of the sale in October, 1909, was applied in payment of trade liabilities, but the book debts turned out so very badly that nothing remained wherewith to pay the cash creditors. One of the cash creditors in May last obtained judgments against Messrs. Sutton and Garsden and the debtor. Garsden filed his own petition in June last in the Blackburn Court, and proceedings were taken against Mr. Sutton in the Liverpool Court in November last, in respect of the judgment, and each partner had now been adjudicated. There was not a quorum of creditors present, and the matter was therefore left with the Official Receiver.

The hearing of a bankruptcy motion took place at Blackburn County Court, on December 12th, when Mrs. Annie Simpson, widow, Birkenhead, applied for a decision of the trustee in the estate of John Wm. Garsden, electrical engineer, in Duke's Brow, rejecting her claim of £1,183 8s. 9d., to be reversed. Garsden formerly carried on business as an electrical engineer in partnership with Samuel Lord (applicant's brother) and Wesley Sutton. That partnership continued until September, 1909, applicant having lent a considerable sum of money to the partnership. When the

partnership was dissolved, the partnership assets were transferred to the Howe Electrical Engineering Co. In June last applicant recovered judgment against Garsden and the two other partners. Then Garsden became bankrupt, and Mrs. Simpson put in proof in the ordinary formal way, but the trustee rejected it on the ground there were joint partners. The application was dismissed, with costs

Electrical Tapes.—MESSRS. JOHN MACLENNAN & CO., of Glasgow and London, who specialise in fine cotton tapes such as are largely used by electrical engineers for insulating purposes, were recently awarded the New Zealand Government contract for railway cords.

For Sale.—The Ayr T.C. has for sale one 50-I.H.P. Belliss compound engine, direct coupled to a 25-KW. single-phase alternator, with exciter, and one 20-I.H.P. Belliss compound engine. See our advertisement pages to-day.

Catalogues and Lists.—MESSRS. POPE'S ELECTRIC LAMP CO., LTD., Hythe Road, Willesden.—This firm has recently issued four different picture postcards in colour emphasising the strength and economy merits of the Elasta metal-filament lamps.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Folder relating to their "Fabroil" pinions which were described in our pages some months ago. We understand that the pinions are being very widely used for driving cranes, pumps, printing presses, &c. Also a folder showing and giving prices of the firm's electric convectors and radiators.

BRITISH THOMSON-HOUSTON CO., LTD., London, E.C.—8-page booklet (No. 2,302) giving information respecting their B.T.H.-Edison carbon lamps.

THE A.E.G. ELECTRICAL COMPANY OF SOUTH AFRICA, LTD., Caxton House, London, S.W.—A batch of publications has been received as follows:—42-page illustrated catalogue very fully describing the Tirrill automatic voltage regulators; pamphlets describing respectively A.E.G. electric crucible furnaces, house water supply pumps, 3·5-100 H.P. C.C. motors and generators with auxiliary poles, electric sinking pumps and cables, and in most cases tabulating prices and other information; reprint describing the Dorman Long electric generating stations at Middlesbrough; and an article relating to reflector selection and height of suspension for street lighting metal-filament lamps.

MESSRS. NEVILLE WILLIAMS & CO., 80A, Southwark Street, London, S.E.—Pamphlet illustrating their "Ensign" standard pattern electric fire, and the "Ensign" fire-box. The former gives a red-hot appearance, and is made for all voltages up to 250 volts. It is a simple design in iron, with a copper ledge in front, and is suited for halls, smoke-rooms, offices, &c. A 12 months' guarantee is given with the heater wire.

MESSRS. LITHOLITE, LTD., 55 and 57, Hackney Grove, London, N.E.—Revised sheet No. 16, showing and giving prices of standard Litholite insulators, including tube-end bushes, lampholder insulators, electrolier nipples, &c.

MR. H. D. BORET, 9, Billiter Square, London, E.C., sends a list of sailings for 1913 for vessels of the Deutsche-Australische Dampfschiffs-Gesellschaft, from Hamburg, Rotterdam, Antwerp, Lisbon and Scandinavia to South Africa, Australia and Netherlands India.

MESSRS. BAXENDALE & CO., LTD., Miller Street, Manchester.—Very fine bound catalogue of 120 pages, art paper, admirably illustrated, covering their electric light fittings. Alphabetical and numerical indexes precede illustrations of great varieties of designs of brackets, ceiling fittings, pendants, electroliers, Holophane fittings, wireless cluster fittings, hall lamps, table and floor standards, church pendants, linen, glass, bead and bamboo shades, and accessories.

THE BRITISH INSULATED AND HELSBY CABLES, LTD., Helsby, near Warrington.—Two new leaflets, one describing, and tabulating sizes and prices of, the Helsby patent condensers, "Telephone" type, and the other the "Power" type for the improvement of power factors and the suppression of arcing in contact breakers and switches, and for high-voltage lighting on A.C. circuits with metal-filament lamps.

THE CONCORDIA ELECTRIC WIRE CO., LTD., Crown Parade, Cricklewood Lane, N.W.—Priced leaflet respecting the "Johnston" automatic pipe wrench and spanner.

THE BRITISH ALUMINIUM CO., LTD., 109, Queen Victoria Street, London, E.C.—Leaflets, in their uniform style, relating to aluminium switch connections, aluminium field coils, aluminium in the gas industry, and the erection and jointing of aluminium overhead conductors.

THE WALSALL ELECTRICAL CO., LTD., 57, Bridge Street, Walsall.—48-page catalogue (January), well-illustrated, with care-arranged prices, brought out in very clear figuring. The contents include switchboards for various kinds of service, switches, cut-outs, fuses, and fuseboards, motor-starters, various electric meters, and other instruments. Owing to radical alterations in prices, clients should have this new catalogue, and a note of discounts, without delay.

THE HURLEY MACHINE CO., Chicago.—16-page pocket pamphlet, attractively illustrating their "Thor" electric wringers and washing machines.

THE ELECTRICAL CO., LTD., 122-124, Charing Cross Road, London, W.C.—56-page illustrated pamphlet (No. 13) containing descriptive and tabulated information relating to their electric heating and cooking material, copiously illustrated and priced. The lines covered include flat-irons, for domestic service, and for heavier work in laundries, tailoring, and other establishments, electric kettles, coffee makers, toasters, sterilisers, water boilers, cooking ranges, ovens, Bastian heaters, and so forth. Copies of the catalogue will be sent on application.

Book Notices.—*Whitaker's Almanack, 1913.*—London: Half-bound edition, 2s. 6d. net; paper covers, 1s. net.—To the office, *Whitaker* is as necessary as a directory; to the library of the reader or student, as essential as the dictionary—perhaps more so, in cases. To both it comes with the regularity and promptness of the income-tax paper, but it receives the welcome always accorded to old friends. The work has deservedly a great popularity in many countries, and at home *Whitaker* is a household word. The present is its 45th annual appearance since Joseph Whitaker first brought together his heterogeneous collection of notes, newspaper cuttings, and Blue Book extracts in a form for publication. The present editor has included a number of new features, bringing the contents up to date, among them being articles on the Insurance Act, Labour Unrest, tables dealing with the devolution of intestates' estates, the last-named being an old feature restored.

The International Whitaker.—London. Cloth, 2s. net. After what we have said of the above, little need be said in commendation of this new volume. Naturally there is not the need among English-speaking abroad for precisely the same information as in the home edition, so, in the place of some sections, the *International* editor has given more complete information relating to other nations. The first part deals with the relative functions of the components of the universe, the second with a general description of the earth, physical geography, &c.; the third, which really forms three-quarters of the entire book, deals with each nation, its area, population, history, industry, trade, communications, and so forth, the fourth giving a list of British and American diplomatic and Consular representatives in foreign countries. This summary of contents should indicate to our readers the almost certainty of the book containing matter which will be of value to them when going abroad or if already there. We understand that the first issue of the book is already exhausted and a reprint is now in hand.

Whitaker's Peerage, Baronetage, Knightage and Companionage for 1913.—London: 5s. net. This is a third work received from the same publisher. It has now reached its seventeenth edition. The great bulk of the contents consists of an alphabetical directory of peers, baronets, knights and Privy Councillors, together with sons and daughters of peers, dowager ladies, Lords of Session, Scottish, Irish, Colonial, missionary and retired bishops, Companions of Orders of Knighthood, Maltese Peers, &c. It is a low-priced guide to these charmed circles, and is therefore a popular one. Every effort has been made to ensure accuracy, but if any of our readers happens to find his name missing from the list, we hope he will not communicate with us, for the editor may not be altogether responsible for the omission.

Rules of Golf.—The Royal Insurance Co., Ltd., 1, North John Street, Liverpool, has issued the sixth edition of this excellent little pocket set of rules. It contains important alterations made at the autumn meeting of the Royal and Ancient Golf Club of St. Andrews, and a comprehensive index, and, we are sure, would be very acceptable to our golfing readers. The company will be pleased to forward copies as far as their stock will permit.

"The Practical Electrician's Pocket-book and Diary, 1913." London: S. Rentell & Co., Ltd. Price 1s. net.

"Winding Engines and Winding Appliances." By George McCulloch and T. Campbell Futers. 1912. London: Edward Arnold. Price 21s. net.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVIII, No. 9. November, 1912. New York: The Society.

"Regulations and Syllabuses for the Examinations in Science and Technology, 1913." London: Wyman & Sons. Price 3d.

"Recherches Expérimentales et Théoriques sur La Commutation dans les Dynamos à Courant Continu." By A. Mauduit. 1912. Paris: H. Dunod & E. Pinat. Price 9 fr.

"*Journal* of the University of Liverpool Engineering Society." Vol. I, No. 2. December, 1912. Liverpool: University Press. Price 1s. 6d. net.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXIX, Part 2. December, 1912. Newcastle-on-Tyne: The Institution. Price 5s.

"La Télégraphie sans Fil pour Tous." By F. Duroquier. Paris: E. Orlhac. Price 3 fr.

"Science Abstracts." Vol. XV, Part 2. November 25th, 1912. Sections A and B. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

"A Laboratory Manual of Alternating Currents." By John H. Morecroft. 1912. London: Longmans, Green & Co. Price 7s. 6d. net.

Dissolutions and Liquidations. — COWPER-COLES INVENTIONS DEVELOPMENT CO., LTD.—This company is winding up voluntarily, with Mr. W. Craddock, 10, Vestris Road, Forest Hill, as liquidator.

HARTLEPOOL ELECTRIC TRAMWAYS, LTD.—At a meeting held at Electrical Federation Offices in London on November 25th, it was resolved to wind up voluntarily, with Messrs. H. W. Davis and H. A. Stagg as liquidators. A meeting of creditors is called for December 30th.

ROSE'S RECORDING TARGET CO., LTD.—A meeting is called for January 20th at 85, Gracechurch Street, E.C., to hear an account of the winding up from the liquidator, Mr. J. Leith.

PUNJAUB ELECTRIC TRACTION CO., LTD.—A meeting is called for January 16th at Broad Street House, E.C., to hear an account of the winding up from the liquidator, Mr. W. L. Waite.

Calendars for 1913.—MESSRS. BRUCE PEEBLES & CO., LTD., of Edinburgh, have again favoured us with one of their khaki-coloured desk blotting pads. Along the top border there is a complete calendar for the coming year, and on the right-hand side, as before, there is an ample supply of squared paper, also a number of

illustrations, with abridged specifications and tabulated particulars and prices, of various electrical machinery manufactures of the firm, also views of the works. The right hand side is probably a convenient position for this material if desks are less congested than those of an editorial office must be.

MESSRS. SIMPLEX CONDUITS, LTD., of Garrison Lane, Birmingham, have sent us one of the excellent pocket diaries which for some years have constantly reminded us of their good taste. The diary is printed on sectional paper, a week to an opening; at the beginning and end of the book, and nowhere else, some particulars are given of the many Simplex specialities, together with a model specification and a collection of useful data. Neatness and convenience are marked features of this useful companion.

THE VICTA ELECTRICAL CO., LTD., of 60, Queen's Road, Battersea, S.W., has issued a wall calendar for 1913, with monthly tear-off slips.

MESSRS. MAWDSLEY'S, LTD., of Zone Works, Dursley, Glos., have sent us a wall calendar for 1913 with monthly slips. The design is very pleasing, and the copy, in suitable colouring, of "A Lassie from Lancashire," (W. E. Webster), in an old plaid shawl, with an appropriate setting with smoky chimneys in the background (wait till all those mills are electrified with Mawdsley's motors!) is quite appropriate for an industrial calendar.

From MESSRS. STEWART & LLOYDS, LTD., of Winchester House, London, E.C., we have received a most acceptable hanging or desk calendar with monthly slips in a neat white and gold frame.

LIGHTING and POWER NOTES.

Aberdeen.—Mr. Bell, the city electrical engineer, has recently presented a report to the Electricity and Cleansing Committees adverse to the proposal to install a refuse destructor and utilise the waste heat for generating electricity. Mr. Bell shows what is fairly well understood now, that there is no saving in using refuse instead of coal as fuel under the conditions obtaining in the modern power station, and suggests that the available power might be employed in making artificial paving.

Argentina.—Messrs. Arias and Torres have obtained a 20 years' concession for an electric light station at Vera (Sante Fe), and also one for a similar period in San Lorenzo (Santa Fe).

Messrs. J. G. White & Co. have applied to the Legislature of the Province of San Juan for a concession to make use of the various water powers in the province for electric power stations, which would embrace nearly the whole of the province.

According to the *Review of the River Plate*, the question of the electric light concession in the city of Buenos Ayres is still engaging the attention of the authorities. A new phase has been given to it by Messrs. Lacroze Bros. who, after numerous interviews with the members of the Council, expressed their willingness to accept a concession from the Corporation under the same terms as those accorded to the German Electric Light Co., and more recently to the Italo-Argentino Co. According to the local Press, however, this willingness on the part of Messrs. Lacroze will not overcome the question raised by the German Electric Light Co., unless the decree of the Minister of Public Works regulating the law which granted the concession to Messrs. Lacroze is derogated. It would appear that the only method of finally arriving at a solution would be by Congress derogating this law, and our contemporary says it will require very strong grounds of argument before taking such a step.

The plans relative to the installation of a hydro-electric power station in the district of the Rio Tercero works, have been approved. The work is to be done by the Central Argentine Railway, and the cost will amount to $150,000.—*Review of the River Plate.*

Bingley.—At the request of the U.D.C., the Electricity Cummittee of the Bradford Corporation has decided to supply electricity to Bingley district at the usual rate. The cost of installation will amount to about £4,000.

Birmingham.—The Electric Supply Committee of the City Council has had under further consideration the scheme for making extensions to the electricity undertaking which have been rendered necessary by the steady increase in output during recent years, and especially since the extension of the city area. Some time ago the Corporation decided to seek Parliamentary powers to acquire from the Birmingham Tame and Rea Drainage Board for extension purposes about 17 acres of land situated between the Nechells destructor and the bacteria beds of the sewage farm at Saltley, and also to raise additional capital to the extent of £500,000 for the purchase of the site and the erection thereon of the necessary works. Under the scheme of Mr. R. A. Chattock, the engineer, it is proposed to erect eventually buildings and plant capable of producing 100,000 KW., but the work will be carried out in sections as the development of the undertaking may warrant. If the proposals meet with the City Council's approval it is intended to commence next spring with the first section; this provides for the putting down of buildings and plant for 25,000 KW. at an outlay estimated roughly at £250,000. The Committee has generally approved of the idea, but before settling the details of the scheme, some of the principal stations in the country are to be visited in order that the Committee may see for itself recent developments in plant, &c. Afterwards the question of estimates will be discussed, and the report and recommendations of the Committee presented to the City Council.

Blackburn.—The town's first electrically-driven weaving shed, the India Mill of the Little Harwood Manufacturing Co., has started with between 200 and 300 looms each with its own motor.

Bolton.—The B. of T. has formally approved of the construction of the new generating station at Back-o'-th'-Bank. The scheme involves an expenditure, for buildings and plant, of £120,000.

Bo'ness.—The T.C. has decided to borrow an additional £1,000 to carry out further extensions upon the burgh electric light installation.

Bradford.—As a result of the action of the Drighlington and Gildersome Gas Co. in increasing the price of gas supplied to the Hunsworth (Yorks.) D.C., it was suggested that the Corporation should be requested to extend its electric lighting system from Tong Street, Bradford, to Hunsworth, and eventually it was resolved that the Corporation should be asked to receive a deputation from the Hunsworth Council to discuss the matter of suppying electric light for Hunsworth.

Carlisle.—The Electricity Committee of the T.C. has decided to entertain applications for the hire, hire-purchase, or purchase from the electricity works of electric cookers, heating appliances, &c.

Continental Notes.—DENMARK.—An important scheme—that of establishing a plant at Holmstad, in Western Sweden—to utilise certain available water-power in the generation of electrical energy, and to transmit the same to Copenhagen for lighting and power purposes, is at present under consideration. It is stated that 15,000 H.P. is available.

SWEDEN.—A correspondent writes that the idea of transmitting electrical energy from the Trollhättan waterfalls to Denmark by a submarine cable from Scania to Zeeland, over the Sound, has been under discussion in interested circles for a considerable time. It is now reported from Copenhagen that an agreement has been made between the South Swedish Power Co. and the North Zeeland Electrical Works and Tramway Co. for the transmission of about 10 million units per year from Trollhättan to Zeeland. This contract is the result of negotiations, carried on since last summer between the two contracting parties, and there is no doubt that the coal famine in Zeeland last summer, in consequence of the British coal strike, acted as an impetus to the speedy realisation of the idea embodied in the agreement made. The permission of the respective Governments has not yet been obtained, but it is thought that the Swedish Government will raise no objection to such an arrangement, by means of which the surplus energy from Trollhättan, which is now wasted owing to the lack of consumers, can be made use of. As far as the consent of the Danish Government is concerned, it is merely a matter of form. Having crossed the Sound, the submarine cable will be landed somewhat to the north of Elsinore, and the electrical energy conveyed to a sub-station, from which it is to be distributed to Copenhagen, where the Danish company is running several tramways, and to other places in the northern part of Zeeland.

Crewe.—The T.C. has decided to replace the oil lamps used for public lighting at Church Coppenhall with electric lamps, at an estimated cost of £430, for which a loan is to be applied for. The annual cost of maintenance will be £2 19s. 6d. per 50-C.P. lamp, or £2 per 16-C.P. lamp.

Croydon.—At the last meeting of the Education Committee a report from the General Purposes Committee was considered recommending the expenditure of £954, in addition to the ordinary estimates of the Committee, for improving the artificial lighting in 10 schools by converting the present lighting from flat-flame gas burners to electric light. Councillor Newnham moved that the question be referred back. It would, he said, cost only £87 to satisfactorily light the schools by incandescent gas. Councillor West said that Councillor Newnham's remarks were somewhat misleading. The £87 was only for converting the present flat-flame to incandescent burners, but the gas company said that would be very unsatisfactory. Incandescent gas required special fittings, and the cost of properly equipping the schools would be over £1,000. It was pointed out that the Winterbourne Road School, with an accommodation for 1,376 children, cost on an average £20 a year for electricity, which included replacement of old-fashioned lamps by new ones. Portland Road, with accommodation for 1,483, was lighted by incandescent gas, at an average cost for the three years, without any extraordinary expenditure, of £28 a year. At Tavistock Road the average cost was £15 for electricity, against Princess Road, with about the same acoommodation, £19 for gas. There was a saving of about £50 a year, which would represent a capital expenditure of £1,000. Counciller Roberts, replying, said that if they were to fit up the schools properly with incandescent gas according to the gas company's ideas they would have to spend £1,100. On the question being put to vote, the amendment was carried by 13 votes to 9.

Darton (near Barnsley).—The U.D.C. has again had under consideration the question of having the district lighted by electricity. The Electrical Distribution of Yorkshire, Ltd., which submitted terms, stated that its figure was £9 15s. 6d. per "pole," which included the full equipment. The estimated cost for the respective localities would be: Darton, 40 lamps, £391; Staincross and Mapplewell, 60 lamps, £664; Barugh and Higham, 46 lamps, £449; approximate total, £1,504. The poles would be of wood; if steel poles were used the increased approximate cost would be 30 per cent. It was decided to refer the matter to the Lighting Committee.

Dawlish.—At a meeting of the U.D.C., on the 11th inst., the surveyor presented a summary of the tenders received for lighting the town from the Gas Co., and the Electric Light Co. Resolutions were adopted by the Council, the effect of which is that the town will be supplied with 34 electric lights at £5 2s., and 106 at £2 17s. per lamp (£537), a reduction of £13 10s. on the gas contract.

Edinburgh.—Recently the Corporation decided to obtain estimates of the cost of lighting the Calton Hill by high-pressure gas. At a meeting of the Parks Committee last week, however, it was agreed that the electric lighting department should have an opportunity of reconsidering its tender for the lighting of the hill, and with this object in view the matter was remitted back to a sub-committee.

Gravesend.—The T.C. intends applying to the L.G.B. for a loan of £2,700 for the electricity undertaking, and for £300 in respect of that at Northfleet. The Empire Cement Co., which desires a large supply of current, has, it is stated, decided to accept the terms of the T.C. as to the supply and guarantee.

Heywood.—At a special meeting of the Electricity and Tramways Committee, the report of Mr. S. J. Watson, electrical engineer of Bury, on the general condition of the electricity undertaking, was discussed. The Committee decided that consideration be deferred, and that Mr. Watson be asked to attend the next meeting.

Hindley.—The agreement between the Lancashire Power Co. and the Council for the supply of electricity in bulk is to be revised to the extent that (1) the electricity will be measured at the sub-station where it is transformed for the service of the Council; (2) that the charge will be at the reduced rate of £4 per KW.; and (3) an acknowledgment of £1 1s. 1d. for large consumers supplied by the Power Co., will be paid to the Council annually in recognition of the Council's rights. A letter has been received from the Board of Trade, stating with regard to the above revised agreement that, under the circumstances, the Board reserves for the present further consideration of the question of revoking the Hindley Electric Lighting Order, 1901.

Hove.—The T.C. on December 12th decided by 25 votes to 4 to proceed with the Bill, the clauses of which include powers to purchase the undertaking of the electric light company.

Hyde.—On the motion of Councillor Pope, the T.C. has instructed the Highways Committee to consider and report to the General Purposes Committee as to the advisability or otherwise of lighting by electricity the whole of the streets on the Stalybridge Joint Board's tramway route from Hyde market place to the corner of Ashton Road and Bennett Street, Newton.

Leicester.—The controversial question of electrical and gas lighting for the streets has arisen. Up to the present the local gas department has been in sole possession of the public lighting but the electricity department having claimed a share in the work, rival installations of high-power lamps have been put up for test purposes, and a local paper suggests that it may be necessary to indulge in blue spectacles when visiting the experimental area. It is to be hoped that the Corporation will seriously consider the question of electric lighting, in view of the recent Manchester reports.

London.—ISLINGTON.—The Special Committee appointed by the Guardians to consider the advisability of introducing electric light and power into the several institutions of the Board, has issued its report. The Committee states that it has considered statements from the Gas Light and Coke Co. as to gas lighting, also reports from Mr. J. Enright, consulting engineer, as to the uses of electricity; in addition it has conferred with the Lighting Committee of the Borough Council as to the lowest terms upon which current could be supplied, with the result that an offer had been made to supply at the flat rate of 2d. per unit under a five years' agreement, the Board to take not less than 125,000 units for power, and after the first year to take a supply to the minimum value of £1,000 per annum. Regarding the question of the cost of the two systems, the Committee makes the following comparison:—Cost of gas per annum £1,320, which, after five years, would be reduced to £1,129; cost of electricity for first year, 100,000 units at 2d. per unit, £833; repayment of cost of installation, £270; maintenance, lamps, &c., £120; total—£1,223. There would also be a saving of expense in cleaning, but the Committee did not go into detail on this point, as it states that in modern public buildings where electricity has been installed, the result has been that considerable saving was effected. Having fully considered the matter, the Committee recommends (1) that the L.G.B. be asked to sanction the installation of electricity for light and motor power in the two workhouses, school and relief offices; (2) that Mr. Enright be employed to prepare plans and specifications, &c., and supervise the works at a commission of 5 per cent. on the expenditure. The consideration of the question was held over at the last board meeting.

BETHNAL GREEN.—In connection with the proposal of the Electricity Committee to take a supply of electricity in bulk from the Stepney undertaking, which was referred back to it at the meeting of the Council in September last, the Committee now reports that it has carefully inquired into the effect of (*a*) the proposal of the Stepney B.C. as to the administration of an electricity supply, and also (*b*) the liability of the Shoreditch B.C. in respect of the mains laid by that authority in the Bethnal Green area, upon the estimates set out in the report of Mr. Snell. Inquiries are continually being made by large manufacturers and others for a supply of electricity, and the Committee is confident that if it were available, some, at all events, of the existing empty property would be let, and a substantial inducement would be afforded for other firms to remain in the borough, rather than to remove to a district where a supply of electrical energy is obtainable. The Committee accordingly recommends (1) that the report of Mr. Snell be received, and the scheme contained therein (already given in this paper) for the proposed supply of electricity within the borough, be approved; (2) That the Council accept the proposal of the Stepney B.C. for a supply of electricity in bulk, on the extra H.T. three-phase system for a period of 15 years, at a charge in accordance with a sliding scale, of £3 per KW., and 0·25d. per unit; (3) That the Committee be authorised to take such action as may be requisite for the purpose of settling the terms of, and entering into, an agreement with the Stepney B.C. to carry into effect the acceptance of this proposal, subject to confirmation by the Council; (4) That application be made to the B. of T. for sanction to the proposed system of electrical distribution, &c.

ST. MARYLEBONE.—In accordance with instructions, Messrs. Price, Waterhouse & Co. have issued a report upon the financial effects of the operations of the Council's sales department arising from the sale of apparatus and works incidental thereto, as distinct from the other duties of that department. The firm state that, as it is always a matter of difficulty to separate entirely the accounts relating to any particular section of business done from those of other sections, they have drawn up a profit and loss account covering, as nearly as could be ascertained, the year ended March 31st last. This account they have divided into two parts, the first of which covers the proceeds and the direct cost of articles sold and services rendered by the sales section, and the second the apportionment of the general expenses of the department. Dealing with the former, the firm state that the gross turnover of the department was £21,388, and the direct cost £15,803, leaving a gross profit of £5,585. Thus the price charged for supplies and work done includes a gross profit of 26·11 per cent., or an addition of 35·3 per cent. to the direct cost of the work done. With regard to the second part of the account, the expenses so apportioned amounted to £4,539, exclusive of any interest on the capital employed, or 21·2 per cent. upon the turnover already referred to. Deducting these expenses from the gross profit, there remains an estimated net profit of £1,045, which is equivalent to 4·9 per cent. upon the turnover, or 8·36 per cent. upon the capital of £12,500, which they estimate to be invested in this section of the department. In another report, upon the revenue account of the whole undertaking for the past quarter, Messrs. Price, Waterhouse and Co. state that the increase in the sales of energy over the similar period last year amounts to 409,128 units, or 19·72 per cent. Eliminating the public lighting figures, the rate of increase is 22·54 per cent. For the six months to September, the increase is 518,505 units, or 11·68 per cent. The number of units sold during this period, so far as private consumers are concerned, is 13·11 per cent. above the quantity sold for the first half of last year. This rate of increase (13·11 per cent.) compares with the rate of 7·5 per cent. allowed in framing the revenue estimates for the current year. The average yield per unit sold to private consumers during the September quarter works out at 2·64d., last September quarter's average being 2·837d. Thus there is a reduction of 6·94 per cent. in the average price obtained during the quarter. In June quarter the reduction was 5 per cent., and the previous September 1·5 per cent. only. Taking the six months, the rate of diminution in price is 5·98 per cent., compared with 5 per cent. diminution allowed in the annual estimate. The income from the sale of energy to private consumers, including meter rentals, amounted to £25,332 for the quarter, against £22,431 for last September—an increase of £2.901, or 12·92 per cent. This is the largest increase in revenue yet obtained in any quarter, summer or winter.

At the meeting of the Council last week, the first portion of the report regarding the sales department came under discussion. Councillor Duncan Watson said there was no evidence that the sales department had been of any use at all to the undertaking. The whole report was based upon the assumption that the sales department was necessary, but this was not the case. Alderman Debenham said the sales department was not an undertaking started because there was a loss on the electricity undertaking; it was to expand the work and to double the sales of electricity. Councillor Strauss supported the Committee, because he was of opinion that it had done its work well, especially in the direction of reducing the price of energy. Alderman Hopkins, chairman of the Electric Supply Committee, pointed out that that Committee had nothing whatever to do with the report. Surely it was not expected that there would be a profit on the publicity department, the object of which was to push the sale of electricity. Did not the gas company advertise their commodity? Councillor New said he looked upon the sales department as being part of the advertising department, and he would not be concerned if it did show a loss, so long as the sale of energy was increased. After further discussion, the report was adopted.

£1,750 is to be borrowed from the L.C.C. for the provision of 50 accumulator cells at the Rathbone Place sub-station.

HAMMERSMITH.—The Electricity Committee has decided to purchase from the Fulham undertaking such electricity as may be required for the purpose of furnishing Olympia with a separate supply of electricity for the purpose of a duplicate system of lighting required by the L.C.C., at the rate of 2d. per unit for a period not exceeding seven years.

Lowestoft.—The T.C. has appointed a committee to report as to the lighting of the streets by incandescent gas and electric light.

Mansfield.—The B. of G. has received the consent of the L.G.B. to the expenditure of £835 for the electric light installation at the Workhouse.

Merthyr Tydfil.—The Public Works Committee of the T.C. has decided to take no action with reference to the purchase of the undertaking of the Electric Traction and Lighting Co.

Peterborough.—From statements dropped by members of the T.C., it is now certain that considerable extensions of the Corporation electricity works are in immediate contemplation. The chief cause is the application by one of the largest of the engineering firms in the town for electricity for power purposes.

Portslade-by-Sea.—The U.D.C. has received notice that the Hove T.C. intends to include in its Bill powers to supply electricity at Portslade.

Radcliffe.—The U.D.C. has applied to the L.G.B. for a loan of £1,000 for additional feeder cables.

It is proposed to open showrooms for electric appliances.

Romford.—The R.D.C. has consented to the application by the County of London Electric Supply Co., Ltd., for a prov. order for electric lighting in the rural area.

Runcorn.—The U.D.C. has sealed an agreement with the Mersey Power Co. for the supply of energy for the pumping station.

Stroud (Glos.).—The R.D.C. has appointed a Committee to meet a representative of Mr. J. H. Edwards, electrical engineer, of Bristol, who is applying for a prov. order for electric supply, and who has asked the Council to waive the serving of the necessary notice. The parishes proposed to be supplied are Whiteshill, Randwick, Cainscross, Stonehouse, Rodborough, Uplands, Thrupp, Stroud Rural, Painswick, Leonard Stanley, King Stanley, and Woodchester.

Swinton and Pendlebury.—The U.D.C. has consented to the Lancashire Electric Power Co. supplying Messrs. A. Knowles and Sons with electricity for haulage purposes, principally at the Pendlebury and Clifton Hall Collieries. The present requirements are about 320 H.P. at Pendlebury and 250 H.P. at Clifton Hall.

Tilbury.—The U.D.C. has decided to oppose the application of the County of London Electric Supply Co. for a prov. order unless the company embodies all that the Council has asked for, including the payment of Trade Union rates of wages in the district to employés.

Torquay.—The T.C. has applied to the L.G.B. for a loan of £6,300, for the purchase of new plant for the electricity works.

Truro.—The General Purposes Committee has interviewed Mr. W. T. Pressland and Mr. E. Lakin Smith, who propose to form a company for the purpose of applying for a prov. order for electric lighting. The consent of the Council was asked for, but the Committee declined to make any recommendation until full particulars of the scheme were given, together with an undertaking that the work would be carried out within a reasonable time. The Committee has also interviewed Dr. Purves, of Exeter, who was instructed to prepare the necessary scheme, plans, &c., for the Council's own prov. order.

Whitstable.—The U.D.C. has decided not to waive the right to receive earlier notification of the proposed application by Mr. G. Stanton for a prov. order for electric lighting. Consequently the application cannot be proceeded with at present.

Worcester.—The application of the City Council for sanction to borrow £7,900 for electricity purposes, has formed the subject of an inquiry by the L.G.B. It was stated by Mr. R. Clarke, the chairman of the Electricity Committee, that there had been an increased demand in the city following the change over to the polyphase system, and additional plant was necessary. The Inspector commented on the progress of the undertaking, which, he said, appeared to have been hard hit by the metal-filament lamp. He thought, however, that two or three years would see it round the corner.

TRAMWAY and RAILWAY NOTES.

Australia.—According to the *Australian Mining Standard* good progress is being made with the erection of the White Bay electric power house, opposite Swan Park, Balmain (N.S.W.), for the purpose of supplying electric power in connection with the western suburbs tramway system. The total estimated cost of the work is £608,500. The buildings are to cost £250,000, and the machinery complete £315,500, including five turbo-alternators and all necessary equipment. The plant is designed for 10 units each of 7,000-KW. capacity. The plant already ordered consists of three 7,000-KW. turbo-alternators and one 7,500-KW. alternator, boilers, and a quantity of other equipment.

Some particulars of the 7,000-KW. sets are given on another page of this issue.

According to the *Mining and Engineering Review*, the Railway Commissioner states that ultimately the whole of the Sydney suburban system will be operated by electric traction, and that a start will be made on the North Sydney to Hornsby line, which carries a large passenger traffic, but terminates on the other side of the harbour, and provides a good harvest for the ferry boats. The Commissioner's idea is to utilise some of the reserve power which will be available when the new White Bay power house, now in course of construction, is completed, and, in the course of a few years, when the bridge across the harbour becomes an accomplished fact, the line will be connected up with the central station, whilst an underground station will be erected in the neighbourhood of Wynyard Square. If electric traction proves a success on this line, the system will be extended to the whole suburban area.

According to the *Mining and Engineering Review*, Mr. Charles Hors, a well-known consulting electrical engineer, has been engaged by the West Australian Government to report on the Perth tramways.

Bingley.—It is recommended that the Bradford Corporation be asked whether it will assent to the provision of a service of railless vehicles between Wilsden and the Bradford tramway terminus; and that application be made to the L.G.B. for the borrowing powers for the estimated cost of street improvements and for the cost of tramway track and equipment.

The District Council has determined to apply for powers to borrow £43,500 to provide for an electric tramway system.

Bradford.—The Corporation is considering the difficulties which have arisen in various parts of the country, as well as in Bradford, in connection with the wearing of roads by heavy motor and trackless tramway traffic. A report on the subject by the city engineer, Mr. W. H. S. Dawson, states that since 1900 the cost of repairing tramway tracks has increased enormously, but it is difficult to say how much of this is due to tramcars, horse vehicles or motor vehicles. The excessive weights and steel tires of motor lorries, however, appear to be chiefly responsible. A clause with a view to regulating this traffic has been inserted in the Bradford Corporation Parliamentary Bill (1913).

Chile.—A new plan for the electrification of the railways from Valparaiso to Santiago and Talca, with branches, has been presented to the Chamber.

Colne.—The T.C. at a special meeting unanimously carried a recommendation to apply in the next session of Parliament for an Act to confirm the purchase of the undertakings of the Colne and Trawden Light Railways Co., and to extend the area of supply of the Corporation for electricity purposes.

Continental Note.—FRANCE.—La Societe Electrique Lille-Roubaix-Tourcoirg has just secured the concession for the construction and working of new electric tramways between Lille and Armentreies, Halluin and Lille, and between Wambrechies and Lille. The new lines will have a length of about 25 miles.

Dundee.—The Corporation Tramways Committee has asked the manager to report on the question of extending the railless trolley system from Clepington Road to Lochee.

Folkestone.—The National Electric Construction Co. is to be informed of the Council's decision not to reopen the question of varying the terms of the agreement entered into between the company and the Corporation in 1906, in regard to the construction of tramways in the town. The company suggested promoting a scheme for railless traction, in substitution for the authorised tramways.

Glasgow.—A number of cases of fraud practised on the T.C. Tramways Department have been dealt with by the local magistrates recently, and sentences running up to 60 days' imprisonment with hard labour have been imposed. The *modus operandi* was to pretend that injuries had been sustained through accidents on cars, and in several cases the insurance underwriters of the Tramways Department were induced to grant monetary compensation.

Hamilton.—An important question affecting the electric undertaking in the burgh was referred to at the monthly meeting of the T.C. According to a Committee, a letter had been received from Messrs. Edmundsons, intimating that they had received notice from the Lanarkshire Tramways Co., terminating the agreement for the supply of electricity as at June next. It was pointed out that the loss to the undertaking would be nearly £1,000 per annum, and that Messrs. Edmundsons understood that the rescinding of the agreement was not due in any way to the question of price, as the Tramways Committee was proposing to pay the same rate to the Clyde Valley Co. The withdrawal of the contract was held by the Council to be unfair to the burgh, especially in view of the Council's attitude in the recent negotiations for the acquisition of the tramways by the County Council of Lanarkshire. It was also maintained that part of the bargain at the close of these negotiations was that all existing contracts in the burghs were to be preserved. In order to avoid any possible misunderstanding in the matter, the Council appointed a deputation to interview the Tramway Co. on the subject of the electric contract.

Heywood.—The Electricity and Tramways Committee has decided to communicate with the Bury and Rochdale Corporations with regard to a supply of current for tramway purposes during the proposed alterations at the electricity works.

Ilford.—The question of applying for powers to extend the tramway system through the Cranbrook Park and Grange Estates, is to be considered at the next meeting of the Tramways Committee.

Leeds.—A serious situation has arisen through the dismissal of four Corporation employés on the tramways and the reduction in grade of another. On Monday the Tramways Committee sat again to consider the case of the men as presented by a deputation from the Association of Tramways and Vehicle Workers, and fully considered the case. It decided to uphold the position of the general manager (Mr. J. B. Hamilton) in regard to each of the five cases. The next move rests with the men, who are very sore at the decision of the Committee. A short time ago a ballot was taken on the question of whether or not they were prepared to withdraw their labour if the men concerned were not reinstated, and the result of the ballot was not made known. Meetings are to be held forthwith to discuss the situation.

Little Hulton.—The U.D.C. on December 12th received from the South Lancs. Tramways Co. an undertaking to construct electric tramways in the township within the next 12 months. The need for such communication between Farnworth and Walkden has long been felt.

London.—The Highways Committee of the L.C.C. has recommended that through services of tramway cars be instituted in connection with the Metropolitan Electric Tramways, Ltd., from Edmonton to Holborn; Seven Sisters' Corner to Euston Road; Finchley to Holborn; Waltham Cross to Smithfield; Muswell Hill to Bloomsbury; and New Southgate to Aldersgate Street.

Morley.—The T.C. has applied to the B. of T. for an extension of time until December 31st, 1913, for the commencement and completion of the tramways authorised by the Morley and District Light Railways Order, 1901.

Ramsbottom.—The U.D.C. has entered into an agreement with Mr. J. B. Hamilton in connection with his services as engineer for the section of the railless traction scheme relating to car equipment, &c.

Rotherham.—A big scheme of tramway extension was foreshadowed by Alderman Winter on Wednesday last week, at the annual tramway staff dinner at Rawmarsh. Mr. Winter, who is chairman of the Rotherham Corporation Tramways Committee, and also a director of the Mexboro' and Swinton Tramways, stated that his company had in view a scheme for the linking up of the districts of Mexboro', Wath, West Melton, Swinton, Goldthorpe, and Bolton-on-Dearne.

Southampton.—The accounts of the tramways undertaking for the half-year ended September 30th last, show a surplus, after providing for working expenses and interest, and redemption charges, of £2,332 over the corresponding period of last year. The total receipts per car-mile amounted to 11·006d., and working expenses to 7·394d.

Tyneside Railway Extension.—The North-Eastern Railway Co. is to carry out extensive alterations to and some extension of its electrical lines at Monkseaton and Seaton Sluice with the object of developing the latter place as a residential area. The estimated cost of the work is £30,000.

Yarmouth.—The borough surveyor has been instructed to submit a comprehensive report, together with plans and estimates, of the cost of laying a double tramway in Regent Road, and on the west side of Market Place, or a single line on the east side.

TELEGRAPH and TELEPHONE NOTES.

Automatic Telephones.—In reply to a question, the Postmaster-General recently stated that the experimental automatic telephone exchange at Epsom had, up to the present, proved very satisfactory, and schemes for the establishment of larger automatic exchanges in Leeds, Brighton and Portsmouth were under consideration.

Cable Rate Reductions.—Replying to a question in the House of Commons, Mr. H. Samuel stated that further reductions in the cable rates between this country and North America, Australia, and New Zealand were in contemplation, and he hoped they would be introduced by January.

Canadian Marconi Co.—The Marconi Wireless Telegraph Co., of Canada, has signed an agreement with the Newfoundland Government under which the Canadian company is granted exclusive rights for wireless telegraph stations until the year 1926. A number of coast stations are to be erected forthwith, in connection with which the company is to receive a Government subsidy.—*Times.*

France.—It is reported from Sweden that the French authorities have recently adopted the Ericsson telephone apparatus as the standard for use at their exchanges. All the French telephone manufactories will be entitled to manufacture the new model, and also to sell it to the public. The Ericsson instruments are at present manufactured in France by a subsidiary company of the Swedish Ericsson Co.

Germany.—A new company has lately been formed in Berlin with a capital of £65,000 and the title the Deutsche Sudsee Gesellschaft für Drahtlose Telegraphie, to establish wireless telegraph and telephone services.

Imperial Wireless System.—On Wednesday last week, Mr. J. E. Taylor was further examined by the Select Committee of the House of Commons on the Marconi Agreement. He stated that if he were free to choose he would adopt the Poulsen system in preference to the Marconi, purely from the technical point of view, but he would not place the contract with the Poulsen Co. without considerable inquiries as to whether they could do the work within 12 months. He admitted that there was a certain amount of risk involved, but he believed the continuous-wave system was more efficient than the spark system. He did not make a definite statement to the Post Office on the subject, as he was not asked to do so. When he realised that he might have a direct connection with the carrying out of the work, he sold his Marconi shares.

Commander F. J. Loring, Inspector of Wireless Telegraphy to the Post Office, was next examined. He stated that at the request of the Foreign Office, the British Consul-General at San Francisco invited the Federal Wireless Co. to arrange for a 10 days' test of the Poulsen system, but the company would not allow it. He held the opinion that the Poulsen system could not be used for long-distance transmission. He thought it had reached the limit of its power. He was convinced that it would be exceedingly risky for the Government to adopt any system that had not been fully proved capable of doing the work. Nevertheless he favoured the continuous-wave system, and believed it would come into general favour sooner or later. He held the view that the agreement with the Marconi Co. would terminate what was at first practically a monopoly; he would not support the agreement if it perpetuated a monopoly. There was no reason why the Marconi Co. should not adopt the continuous-wave system. The erection of the stations by the Government would involve delay, and would hamper the work of the Admiralty. The effect of the agreement would be to allow the Marconi Co. to remain as long as they kept pace with the science; they were in advance of all the others, and the Government had no alternative but to accept their terms if they were reasonable. He thought that experts jumped to conclusions, and that very often, when a question of practical policy arose, it was better to take the opinion of someone who knew a good deal less of the subject.

No one was able to explain some of the troubles met with in communication over long distances. He considered that the present system of communication between Clifden and Glace Bay would be satisfactory from a strategical point of view. The reason why the Wireless Committee's recommendation that the Poulsen system should be inquired into was not carried out was because Clause 4 gave them all the protection that was necessary. He was not more closely in touch with the Marconi Co. than with any other company. It was absurd to ask people to tender when they had no chance of success. He had no financial interest in the Marconi Co., or any company connected with them.

On Thursday Sir George Reid, High Commissioner for the Australian Commonwealth, gave evidence. He said that his Government declined to join in the Marconi agreement, because they preferred to erect their own stations. The Commonwealth Government in December last year did not regard the Marconi Co. with much favour, and had accepted tenders from the Australian Wireless Co., a rival concern. The impression he had received was that the Marconi Co. had established reliable communication over long distances, and that no competitor was in a similar position. His Government did not appear very desirous of joining in the agreement; they had their own expert, Mr. Balsillie, and seemed inclined to erect their own stations. He had not realised the danger of delay, in view of the possibility of foreign Governments establishing long-distance stations. He was not surprised that the report of the Technical Sub-Committee was never submitted to the Imperial Wireless Committee. He regarded the establishment of an Imperial wireless chain entirely from a strategic point of view, and laid most stress on reliability and urgency. There was a conference in Melbourne in 1909, which showed the urgency of the matter. Australia led the way, as usual; long-range stations had been erected at Fremantle and Sydney, with ranges of 1,250 miles by day, and 2,500 miles by night. Several other stations had been erected in Australia, and communication could be effected with New Zealand. The contracts were for the Telefunken system. Between Port Darwin and Singapore the Balsillie system would be used, which was said to be quite clear of the Marconi patents. The Australian Government would co-operate with the Imperial Government in connection with the Imperial wireless chain, and had no feeling whatever against the Marconi Co.

Sir Richard Solomon, High Commissioner for the Union of South Africa, was next examined, and said that his Government joined the agreement when it appeared that the Poulsen Co. could not carry out the necessary tests within the time available. Distance covered, speed and reputation were the considerations that decided him in favour of the Marconi Co.; and his Government approved the agreement because delay was dangerous, the Marconi Co. was the only one that could do the work, and good terms had been arranged by the Post Office. Even if the Poulsen Co. had shown that they could comply with the conditions, no good purpose would have been served by summoning the Imperial Wireless Committee to consider the report of the Technical Sub-committee; the Committee would not have reopened the negotiations, even if the report had been favourable to the Poulsen Co. The Committee wanted to get on with the work.

Mr. Davis, solicitor to the Post Office, and Mr. Farnall, one of the

assistant secretaries, gave evidence regarding the draft agreement and the course of the negotiations.

Military Wireless.—It is reported that the Army authorities have decided to establish 20 wireless sections, similar to that of the Royal Engineers, at Aldershot. Each of the new sections will carry its apparatus upon light wagons, capable of keeping pace with the Royal Horse Artillery or the cavalry if necessary. As a result of this extension, it will be necessary to enlist a number of skilled operators.

Postal Telegraphs.—The report of the Postmaster-General for the year 1911-12 was recently issued. It states that during the year 71,716,000 ordinary telegrams were transmitted, an increase of 2·8 per cent.; 4,472,000 Press telegrams, and 16,931,000 foreign telegrams were also handled. The receipts were respectively £2,216,592, £148,394, and £502,413. Railway telegrams (mostly free) numbered 1,535,000, and Government free telegrams 546,000, the total of all kinds being 89,200,000, bringing in a revenue of of £2,867,934. The telegraph system was extended to 110 post offices, and on March 31st there were 11,561 post offices open for public service, as well as 2,425 offices at railway stations, &c.

A night telegraph-letter service was introduced on January 1st experimentally, and has since been extended to all offices open all night. The delivery by telephone of telegrams addressed to tele phone numbers has been extended.

The coast communication system has been improved, 150 extensions to lighthouses, &c., having been made.

The underground telegraph line between Leeds and Hull is approaching completion, and during the current year cables will be drawn into pipes between Canterbury and the coast, completing the line, and enabling the landlines in connection with France and Belgium to be put underground. The Birmingham-Bristol line has been extended to Cardiff. The stability of the overhead lines has been increased, and the liability to breakdown considerably lessened.

The use of the telephone in small offices instead of the Morse sounder has been extended, and proves very efficient both in speed and accuracy. Two superposed telegraph circuits for duplex working have been installed between Leeds and Scarborough with excellent results, and the system will be extended. The use of high-speed machine telegraphs has been adopted on several additional routes, and the Baudot working between London and Birmingham is satisfactory. Eight telegrams can now be sent over this one circuit simultaneously, and 600 have been dealt with in one hour. Murray multiplex working has been introduced between the Central Telegraph Office and Manchester, and the Murray automatic system on one of the London-Leeds wires.

The increased use of high-speed working has set free room on the poles for many trunk telephone circuits.

Baudot multiplex working has been permanently established on wires to Amsterdam and Berlin, with satisfactory results, and the system will be extended.

Reference is made to the steps which have been taken to secure Government control over the rates charged for trans-Atlantic telegraphy through the licences for landing rights. The arrangements made for day cable letters, plain language deferred telegrams, and non-urgent Press telegrams, and the reductions of foreign telegraph rates generally, are also described.

About 425 British ships are now equipped with wireless apparatus, as compared with 290 in the previous year; the outward radio-telegrams to ships numbered 6,680, and inward telegrams, 37,827, an increase of 11·8 per cent., the revenue being £7,941. In March last the Cullercoats station was purchased, and the whole of the ordinary commercial ship-and-shore business of the country is now in the hands of the Post Office, apart from the long-distance Marconi stations at Clifden and Poldhu. The coastal service is undergoing complete reorganisation.

From May 1st, telegrams for the United States and Canada have been accepted for transmission *viâ* Clifden and Glace Bay, at 4d. a word less than the cable rate for ordinary and 2d. less for deferred telegrams. During the year, 153 new licences for wireless telegraphy, covering 202 land stations, were issued. On March 31st, there were eight licences in existence for private business and 258 for experiments.

The telephone transfer is dealt with at considerable length, and the difficulties consequent on the transfer are explained in detail; it is admitted that the present position is unsatisfactory, and that the service has suffered from the effects of the transfer, but the troubles are of a temporary character and will be removed as quickly as possible.

Besides the automatic exchanges installed at Epsom and the Official Exchange of the Post Office, another type is to be tried at Hereford. Conversations over the trunk lines numbered 33,499,495, bringing in a revenue of £855,411 from inland calls, and £25,772 from Continental calls. The original Post Office London Exchange system included 81,339 subscribers' stations and 905 call offices; the total number of calls originated was 99,890,000, and the length of underground wires (including 49,168 miles for telegraph and 15,202 miles for trunk telephone purposes) was 552,973 miles, the net increase during the year being 41,919 miles. The number of telephone stations transferred from the National Telephone Co. was 140,947, and the total of the combined systems on March 31st was 232,009. During the year 110 Post Office exchanges were opened in the provinces, and 46 public call offices at small places, besides 34 call offices with limited facilities. The total number of Post Office telephone stations in the provinces at the end of 1911 was 45,607, and the National Telephone Co.'s total was 420,791; at the end of March the combined total was 471,972. The rates for "farmers' lines" had been revised, and an active canvass is in progress. The Corporation of Hull, whose licence expired on December 31st, will continue to work the telephone system as agents of the Post Office until the terms of purchase are settled. The licence of the Corporation of Portsmouth does not expire till 1926, and the Post Office having taken over the National Telephone Co.'s plant is therefore in competition with the Corporation.

As soon as it is possible to bring the new submarine telephone cable laid by the French Government into use, the rates for telephonic communication with Paris will be lowered by half, and other reductions will be made. The Anglo-Belgian telephone cable will be brought into use as soon as the necessary landlines in Belgium are completed, and negotiations are in progress with a view to obtaining a telephone service between this country and Holland and Switzerland.

The total mileage of Post Office wires at March 31st, 1912, was, for telegraphs, 313,805; for telephones, 2,234,215; and private wires, 62,630. Of these, 870,973 miles were aerial, 1,729,131 underground, and 10,546 submarine—total, 2,610,650.

On the transfer of the National Telephone Co.'s business, 10,592 men and 8,404 women were taken into the service of the Post Office.

The telegraph revenue of the year was £3,149,484, a decrease of £16,523; the expenditure, including interest on the purchase-money, was £4,276,877, a decrease of £75 803. The net deficit was thus £1,127,393, or £59,280 less than last year.

The telephone revenue was £3,542,187, an increase of £1,603,858, and the expenditure £2,788,216, an increase of £789,025, subject to adjustment when the purchase price of the National Co.'s system is known. The net revenue of the postal, telegraph and telephone services was £5,165,175, an increase of £939,179.

South Africa.—The telegraph department has arranged to keep wireless stations at Durban and Slangkop in continuous communication with Cape Town, East London, Port Elizabeth, and Mossel Bay, to ensure that distress signals received at either station will be instantly transmitted to the port in the best position to render succour to any vessel needing it.

The Telephone Service.—Replying to questions, the Postmaster-General stated that for the year ended March 31st, 1912, the capital expenditure on trunk lines was somewhat less than the expenditure for the previous year. A very large number of additional circuits was being constructed during the current financial year. He also gives the following figures regarding telephone subscribers and rentals:—

	National Telephone Co.'s system.	Original Post Office system.
Total number of subscribers' lines (excluding call offices) on January 1st, 1912	362,614	80,456
Approximate percentages of these paying subscriptions at the following rates (with approximate rentals where available):—		
Unlimited service ...	39 per cent. (£1,574,000)	17 per cent.
Message and measured service rates introduced before 1907 ...	26 per cent. (£684,000)	65 per cent.
Measured service rates introduced in 1907 ...	35 per cent. (£1,027,000)	18 per cent.
Party line rates (included in the above)...	11 per cent. (£160,000)	·3 per cent.

Wireless Telegraphy.—The *Century Magazine* says that there are nearly 100,000 amateur wireless receiving stations in the United States, of which about 40,000 are also equipped for transmitting messages to short distances.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—VICTORIA.—January 24th. Two 4,000-KW. steam turbo-alternators, for the Melbourne City Council. See "Official Notices" November 22nd.

January 8th.—Railways Construction Branch of the Commonwealth Dept. of Home Affairs. Tubular iron or steel poles and fittings for 1,062 miles of two-wire telegraph line (average 20 to 30 poles per mile), with insulators, copper wire, &c., for the Kalgoorlie —Port Augusta Railway.—*Board of Trade Journal.*

January 3rd.—1,100 opalescent arc lamp globes, for the Melbourne City Council. See "Official Notices" to-day.

January 28th.—Paper-insulated lead-covered cable for the P.M.G.'s department. See "Official Notices" to-day.

February 21st.—Four 1,500-KW. rotary converters, for the Melbourne City Council. See "Official Notices" December 6th.

SYDNEY.—January 20th. Storage batteries, motor-generators and switchgear. City Electrical Engineer, Town Hall.

TASMANIA (HOBART).—January 13th. P.M.G.'s department:—Paper-insulated lead-covered cables. See "Official Notices" December 6th.

QUEENSLAND.—January 29th. Detectors (Schedule 242), for the P.M.G.'s Department. See "Official Notices" to-day.

WESTERN AUSTRALIA.—February 19th, 1913. Armoured telegraph cable, for the P.M.G.'s department. See "Official Notices" to-day

Belfast.—January 1st. The Harbour Commissioners are inviting tenders for a 120-ton electric derrick crane at Alexandra wharf. Specifications, &c., from Mr. W. R. Kelly, Harbour Engineer, Harbour Offices, Belfast.

Belgium.—BRUSSELS.—Tenders are requested for the telephone instruments and accessories needed for the projected improvement of the telephone system throughout Belgium. In 23 lots. Particulars in cahier spécial de charges No. 3,605, of Musée Commercial, Rue des Augustins, Brussels.

Bohemia.—SMICHOV.—January 3rd. Tenders are invited for the installation of the electric light in the new Post Office buildings. Particulars of the K.k. Statthalterei, Prague.

Eastbourne.—January 14th, 1913. One 1,000-KW. horizontal steam turbine and alternator, without condensing plant, for the Corporation. See "Official Notices" to-day.

France.—BOURGES (CHER).—January 16th. Tenders are invited for the supplying of two lots of electric cable, wire and accessories for the electric installation at the Bourges railway workshops. Particulars obtainable at the works or at 2, Avenue de Saxe, Paris, and samples submitted before December 23rd to the Directeur de l'Atelier de Construction de Bourges. Lots not adjudicated upon will be reconsidered on January 30th, and samples therefor should be forwarded before January 21st.

VOSNE-ROMANEE (COTE-D'OR). — December 23rd. Tenders are required for the construction and installation of electric hydraulic machinery, to raise the waters of the River Bornue to the Le Grande Rue reservoir. Guarantee, 500 fr. Particulars from the Mairie of Vosne Romanée.

Harwich.—January 13th. Four motor-driven centrifugal pumps, two motor-driven sewage rakes and screens, with switchgear, and about 400 yd. of 15-in. cast-iron rising main, for the Corporation. See "Official Notices" to-day.

Hebden Bridge.—December 31st. One 240-KW. Diesel engine and dynamo, for the U.D.C. See "Official Notices" December 13th.

Leeds.—December 27th. Electric lighting installation at Holbeck Union Workhouse. G. Diment, Clerk to Holbeck B. of G., Lane End Place, Holbeck.

London.—FULHAM.—January 9th. Steam dynamo, switchboard and connections for the Workhouse, Fulham Palace Road, W., for the Guardians. See "Official Notices" December 6th.

Manchester.—December 23rd. Testing battery at the Polygon Works of the Electricity Committee. Specifications, &c., from Mr. F. E. Hughes, Secretary, Electricity Department, Town Hall.

New Zealand.—January 6th. Switchboards, for the Auckland Harbour Board. See "Official Notices" November 15th.

Norway.—December 28th. The Norwegian State Railway authorities in Christiania are inviting tenders for the supply of an electrically-operated travelling crane.

South Africa.—December 31st. 107,580 yards of insulated wire, 6,336 yards of flexible wire, and 25 cwt. of bare copper wire, for delivery during February next. Tenders to Secretary to Tender Board, S.A. Railways Headquarter Offices, Johannesburg. Further particulars at the B. of T. Commercial Intelligence Department in London, and in the current *Board of Trade Journal*.

JOHANNESBURG.—January 22nd. Tenders are requested for the supply and erection of electric bells and carillons in new Government buildings in a large South African town. Tenders to be forwarded by mail leaving Southampton at latest on December 25th. Particulars of South African Union Offices, Victoria Street, S.W.—*La Métallurgie*.

January 21st.—31,800 tungsten wire-drawn lamps for train lighting, for the South African Railways Administration. Secretary, Tender Board, S.A.R. Headquarters Offices, Johannesburg; High Commissioner, 32, Victoria Street, London; B. of T. C.I. Department, London.

Spain.—The municipal authorities of Huesca have just invited tenders for the concession for the electric lighting of the town during a period of ten years.

Sweden.—December 31st. An electrically-driven trestle crane of 50 tons; 17 metres gauge for Alfkarleby power station. B. of T. C.I. Department in London.

Uruguay.—March 29th. Five electric gantry cranes for Customs warehouses at Monte Video. B. of T. C.I. Department in London.

CLOSED.

Australia. — MELBOURNE. — The *Australian Mining Standard* reports the placing of the following contract by the P.M.G.'s department :—

5-KW. 500-period converter, £525; two tuners, £105; six 7-KW. rotary converters, £1,950.—Maritime Wireless Co. (Shaw System), Ltd., Sydney.

BRISBANE.—P.M.G.'s department :—

2,000 "Hellesen" dry cells, at 2s. 9d. each.—Brisbane Electrical Co., Brisbane.

Ayr.—The Corporation has agreed to accept the tender of Messrs. Walter Scott, Ltd., for Sandberg rails, at £1,930 15s., plus 5s. per ton payable to the patentee; and Messrs. Callender's tender, of £2,048 13s., for the cables has also been accepted.

Barnsley.—The Corporation has accepted the tender of Messrs. S. Rushforth & Son, amounting to £35, for electric wiring at new waterworks and workshops.

Brighton.—The B. of G. has decided to have a private telephone service installed between the new receiving homes and infirmary and the superintendent's office, &c., together with an electric fire-alarm system, at an estimated cost of £82.

Chester-le-Street.—The B. of G. has accepted the tender of Messrs. S. Stobart & Co., amounting to £375, for lighting by electricity the workhouse, offices and other buildings. The other tenders were :—

N.E.G. Electric Co., Ltd. ..	£378	R. W. Cairns	£497
Falconer, Cross & Co.	437	Robson & Coleman	480
T. G. Usher & Co.	467		

Douglas (Isle of Man).—The T.C. has accepted the tender of Mr. Hanson Perry for wiring and fitting the Villa Marina for the electric light, at £520, and appointed Mr. F. R. Edmondson to supervise the work.

Dublin.—The Dublin United Tramways Co. has ordered 50 car meters from Messrs. Chamberlain & Hookham, Ltd.

Dundee.—Messrs. D. H. Fleming, Sons & Co., Lochee, have ordered from the Schorch Electrical Co., London, 150 "Schorch" single-drive motors for their jute weaving and preparation machinery.

France.—The competition for the supply of telephone instruments and material in 11 lots to the French Administration des Postes et Telegraphes, tenders for which were returnable on November 23rd, has been decided as follows :—Lot 1, successful tenderers, Mambret et Cie., 25·35 fr. each. Lot 2, Association des Ouvriers en Instruments de Précision, 21·60 fr. each. Lot 3, not adjudged, all tenders above price limit. Lot 4, ditto. Lot 5, M. Delafon, 5·53 fr. each. Lot 6, ditto, 5·49 fr. Lot 7, ditto, 5·48 fr. Lot 8, M. Sidot, 5·58 fr. each. Lot 9, Société des Téléphones Système Berliner, 3·95 fr. each. Lot 10, Société Industrielle des Téléphones, 3·57 fr. each. Lot 11, Mildé Fils et Cie., 6·45 fr. each. The competing firms included, besides those named, Messrs. Thomson-Houston and Le Matériel Téléphonique.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named :—

WAR OFFICE.

Electric cable.—Johnson & Phillips, Ltd.
Electric motors.—Laurence, Scott & Co., Ltd.
Installation of electric light, &c., Old College, Sandhurst.—V. G. Middleton.
Overhead conductors and supports for electricity supply at Tidworth and Bulford.—British Insulated and Helsby Cables, Ltd.

INDIA OFFICE, STORE DEPARTMENT.

Cells.—Siemens Bros. & Co.

CROWN AGENTS FOR THE COLONIES.

Diesel engine set.—Willans & Robinson.
Insulators.—Bullers, Ltd.

GENERAL POST OFFICE.

Telephonic apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.: Western Electric Co., Ltd.
Telephonic cable.—British Insulated and Helsby Cables, Ltd.; W. T. Henley's Telegraph Works Co, Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Insulators.—Taylor, Tunnicliff & Co., Ltd.
Telegraphic ironwork.—Bullers, Ltd.; Guest, Keen and Nettlefolds, Ltd.; T. W. Lench, Ltd.
Secondary batteries, Central Telegraph Office, London, E.C.—Sandycroft, Ltd.
Telephone exchange equipment, Hop Exchange, London, and Kensington, W.—Western Electric Co., Ltd.

Gravesend.—The T.C. has received the following tenders for the supply of boosters for the Northfleet station :—

Crompton & Co., Ltd.	£150
Lancashire Dynamo Co.	150
Electromotors, Ltd.	221
Cie. de l'Industrie Electrique et Mecanique	246

The Council has accepted the tender of the Lancashire Dynamo Co. for a switchboard panel, at £50.

London.—L.C.C.—The Stores and Contracts Committee recommends the acceptance of tenders from the following for materials during 1913 :—

Electric carbons.—Sloan Electrical Co., Ltd.
Electric flexible cords.—Liverpool Electric Cable Co., Ltd.

BERMONDSEY.—The Electricity Committee has accepted the tender of Messrs. Lassen & Hjort, at £535, for new softening plant at the electricity works, capable of treating 7,000 gallons per hour.

Lowestoft.—The T.C. has accepted the tender of Messrs. Estler Bros. for a supply of tramway trolley wheels; also the tender of the British Thomson-Houston Co. for three sets of resistances for tramcars. The tenders of Messrs. J. W. Brooke and Co. have further been accepted for a supply of brake blocks, at £6 12s. 6d. per ton, and metal castings, at 1s. per lb.

Mersey.—The Mersey Docks and Harbour Board has accepted the following tenders :—

Spencer & Co., Ltd.—To convert the present floor of No. 6 bridge, Prince's landing stage, into two movable electric baggage platforms.
Edison & Swan United Electric Light Co., Ltd.—Insulated electric cable.

Reading.—The T.C. has accepted the tender of Messrs. Allen & Simmonds, of the Thames Side Engineering Works, for carrying out improvements to the steam engines at the power station, at £185.

West Bromwich.—The Electricity Committee of the T.C. has accepted the tender of Messrs. Musgrave & Co., Ltd., for induced-draught plant for new boilers.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, December 20th. Paper on "Electric Power Plant Troubles and Breakdowns," by Mr. E. F. Hetherington.

Institution of Electrical Engineers (Newcastle Students' Section).—Friday, December 20th.—At Tilley's Market Street Rooms, Newcastle. Annual Dinner.

Association of Mining Electrical Engineers (West of Scotland Branch).—Saturday, December 21st. Meeting. At 4.30 p.m. At the Royal Technical College, Glasgow.

NOTES.

Our Next Issue.—Owing to the Xmas Holidays our issue of next week will go to press two days earlier than usual, and all matter must be in our hands by Monday mid-day, excepting late news, which can be handled up to Tuesday morning.

"A Merry Xmas."—The ELECTRICAL REVIEW wishes everyone whose eyes these words may meet a merrier Xmas than he has ever had before. The Scrooge of the electrical industry has buried his past, and the Spirit of Christmas is abroad. At the moment grumblers are not numerous. Many men will leave their offices and works with a lighter heart this year than they have sometimes had on Xmas Eve, for trade is good. After a few days' respite, they will return to work off accumulating orders and ready to prepare for a record year in 1913. To many of our foreign and Colonial readers these lines will only come when Xmas is an event of the past. To these—indeed, to all—we send a wish for a New Year of Great Prosperity.

Copper.—Messrs. Merton's statistical circular for mid-month (December 14th) shows stocks in England and afloat thereto at 39,393 tons, a reduction of 1,323 tons on the quantity under the same heading on November 30th. The quantity actually in English ports has increased by 617 tons, the reduction being made up of 715 tons less at Havre, 225 tons less afloat from Chile, and 1,000 tons less from Australia. The European stocks are less by 1,394 tons, Hamburg having put out or consumed 71 tons. Stocks in Rotterdam, at 350 tons, are very low just at present.

In detailed supplies North America sends Europe 13,576 tons, which, if doubled, would give an average quantity for the month. Spain and Portugal have sent nearly two-thirds of their average in the fortnight; Chilean shipments are above the average, and Australian the same. The total deliveries, at 24,096 are fairly high, though, with the holidays intervening, there is no reason why the second half of the month should show figures the same as the first half. American producers' stocks, at 38,466 tons (end of November) showed an increase of 4,205 tons over the figures for October 31st. The world's supply for November 30th showed an increase of 1,145 tons over that on October 31st. The figures are 81,747 tons.

Feeder Pillars Again.—A serious interruption to the lighting and power supply at Stretford, happened on the 16th inst., about 11 o'clock in the forenoon. A main feeder pillar-box, situated at the junction of Chester and Stretford Roads, was completely demolished by a heavily-laden horse lorry, which had pulled up at an adjacent water trough. The horse, it appears, started prematurely, crashing with great force into the pillar-box. In connection with the feeder pillar, which is a very large one, containing some 30 or 40 main cable connections, there is a sub-pit directly underneath the pillar base, and the lorry was precipitated therein. The *débris* caught fire and ignited the lorry, but this outbreak was quickly suppressed, and, fortunately, both horse and lorry were extricated, little the worse for their mishap. After the pyrotechnic display, nothing remained of the feeder pillar but an almost unrecognisable mass of blackened ruin. The supply to the district affected (Old Trafford) served from the feeder pillar, was totally cut-off until about 4 p.m., by which time temporary arrangements had been made for practically normal supply. Fortunately, no interruption was occasioned to the public street arc lamps and tramway supply, these circuits being both controlled and fed from a different point.

Will.—According to the *Times* the late Sir J. Irving Courtenay left unsettled property of the gross value of £48,694, of which £48,204 is net personalty.

Parliamentary Notes.—TRAMWAY ACCIDENTS.—Mr. Fell asked the President of the Local Government Board if any further Orders had been granted for the construction of tramways on steep gradients; if his attention had been called to the recent accidents to tramway cars on such hills owing to the failure of the brakes to act; and if any brake had been found for tramway cars which was really efficient under all circumstances.—Mr. Robertson, in reply, said that all proposals for tramways on steep gradients were carefully considered by the Board of Trade, and provisional orders authorising such tramways were submitted to Parliament for confirmation only when the Board were advised by their inspecting officer, that, subject to the provision of proper arrangements and the exercise of due precaution, there was no ground for refusing sanction to the proposals. Some of the recent accidents to which the hon. member referred, were not due to any fault of the brakes, but to the brakes being improperly used. There was no brake which was really effective in all circumstances if not properly used, but tramways on gradients were approved only on condition that the brakes provided were sufficient if properly maintained and used to control cars.

WIRELESS TELEGRAPH EXPERTS.—Attention having been called to the statement of Capt. Charlton at the Marconi Inquiry that there was great difficulty in finding suitable wireless experts, Mr. Churchill said that the only three civilian experts in wireless were required to assist naval officers, and there was no probability of another being required under present circumstances. The definition of a University education had been interpreted in a wide sense, and provided that the candidate possessed the requisite technical qualifications, no rigid line would be drawn as to the college or institute at which he might have been trained.

ROYAL ASSENT.—The Light Railways Act, 1912, and the Electric Lighting Orders Confirmation (No. 4) Act, 1912, have received the Royal Assent.

The Melbourne Railway Electrification Contracts.—In connection with this scheme the total amount of the suggested appropriations for which is £2,537,000, £1,112,000 being in respect of tenders that have not yet been invited, while £1,425,000 is based upon the tenders that have already been submitted, *The Melbourne Argus* says that the items in respect of which tenders have been invited, and the approximate appropriations, are :—

Power Station.—Boiler house and boiler house equipment and structural steel work, £300,000; turbo-alternators and transformers, £140,000.

Distribution System.—Sub-station equipment, £225,000.

Rolling Stock.—Rolling stock electrical equipment, £760,000.

The following firms have tendered :—A.E.G., Berlin; Allen, Son and Co., Ltd., Bedford; Babcock & Wilcox, London; Belliss & Morcom, Birmingham; B.T.H. Co., Rugby; British Westinghouse Co., Manchester; Brown, Boveri & Co., Ltd., London; Danks & Co., Ltd., Birmingham; Dick, Kerr & Co., Ltd., London; Escher, Wyss & Co., London; Ferranti, Ltd., Hollinwood; General Electric Co., Ltd., Birmingham; General Electric Co., New York; Mirrlees, Watson & Co., Glasgow; Parsons & Co., Ltd., Heaton; Reyrolle & Co., Ltd., Hebburn; Richardsons, Westgarth & Co., Hartlepool; Siemens Bros. Dynamo Works, Ltd., London; Stirling Boiler Co., London; and Willans & Robinson, Ltd., Rugby.

The detailed capital expenditure estimated as necessary to furnish an electric service to deal with the traffic in 1915 is as follows :—

Power station			£761,053
Transmission system—			
Underground cables			83,188
Overhead transmission lines			59,875
Sub-stations			328,708
Track equipment			562,280
Alterations to ways and works—			
Overline structures			4,350
Telegraph and telephone wires and other sundries			20,000
Equipment of car-sheds, pits, &c.			66,000
Rolling stock—			
Electrical equipment of coaches ...	£634,354		
Coach bodies and bogies	485,050		
	£1,119,404		
Less cost of providing additional steam stock—			
Credited to electric scheme	£821,438		
Net cost of electric rolling stock			297,966
			£2,183,420

It is interesting to note that the resolution embodying the recommendation of the Government that the report should be adopted, has been passed by the Victorian Legislative Assembly (Lower House) by 43 votes in favour to 5 against. The resolution comes before the Upper House this week.

Clyde Electricians' Strike.—A settlement has been arrived at, and work resumed by the Clyde electricians, members of the Electrical Trades Union, who had been idle for about three weeks in consequence of a wages dispute. The men returned at the same rates of wages as prevailed before the dispute arose.

Railway Fraud.—The sixteen employés of the London Electric Railway Co., who, as already reported, were charged with defrauding the company by intercepting and selling unclipped tickets, have been committed for trial, bail being allowed.

(*Continued on page* 1004.)

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LARGE WILLANS TURBINES FOR SYDNEY.

Messrs. Willans & Robinson are completing the third of four large steam turbines for the New South Wales Government Railways.

In 1911 a 5,000-kw. Willans turbine set was brought into use at the Government's Ultimo Power Station, and subsequently the N.S.W. Government ordered the four units mentioned above. The first of these is a duplicate of the plant already supplied, and will be installed in the Ultimo Station, but the remaining sets are to be installed in a new station situated at White Bay—both stations being in Sydney.

The White Bay sets differ in size from those at Ultimo, in having a capacity of 7,000 kw. each. All these sets run at a speed of 750 r.p.m., which apparently low speed is due to stringent conditions imposed by the specification in the matter of temperature rise; moreover, where such large units are nstalled thousands of miles distant from the makers' works reliability is obviously of paramount importance.

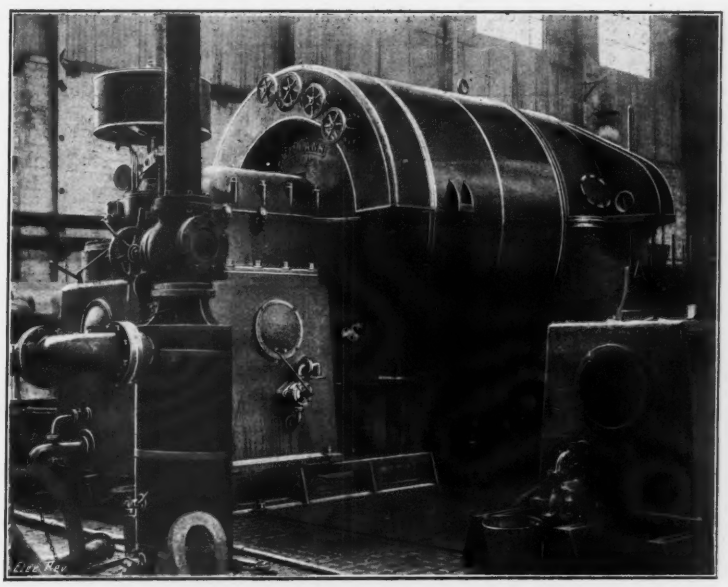


Fig. 1.—7,000-k.v a. Willans Disk and Drum Turbine in the Erecting Shop.

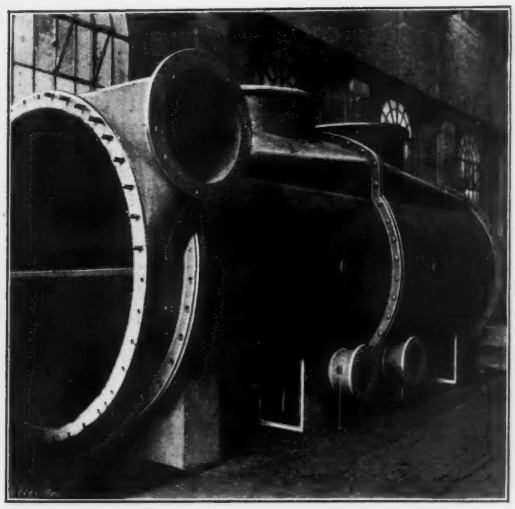


Fig. 2.—Condenser, Built in Halves for Transport.

The Ultimo turbines are designed to work with steam at a pressure of 150 lb. at the turbine stop valve, superheated 100° F.; the White Bay machines will work with a steam pressure of 190 lb. and a superheat of 200° F.

Fig. 1 illustrates the first of the White Bay turbines in Messrs. Willans's erecting shops connected up for steaming light. The machines are of the maker's standard disk and drum type, and embody the following special features of design:—The nozzle chest consists of a separate cast-steel body to withstand high degrees of superheat. The governor gear is of the standard direct-acting throttle type, a simple arrangement which at the same time ensures sufficient accuracy in governing to meet the severe conditions prevailing on the pure traction load at Sydney. The impulse blading used is of special bronze, and the reaction blading is of the Willans patent shrouded type built up in sections, no individual caulked distance pieces being used.

The condensing plants for all these sets are of the Willans vacuum-augmentor type, with motor-driven Edwards air and circulating pumps. Fig. 2 shows one of the White Bay surface condensers in the erecting shop; this condenser has a cooling surface of 13,750 sq. ft., and it will be noted that the condenser body is split vertically to facilitate transport.

The plants are designed to maintain a vacuum of 28·35 in. (Bar. 30 in.) when supplied with cooling water at a temperature of 70° F., and when dealing with the exhaust steam from the turbine when working on full load.

The generators throughout are of Messrs. Dick, Kerr and Co.'s manufacture, designed for a pressure of 6,600 volts, unity power factor, and a frequency of 25 cycles.

These machines have salient pole rotors, and are of the makers' standard totally enclosed, chimney type, vertically divided in the case of the 7,000-k.v.a. machines, and horizontally divided in the 5,000-k.v.a. machine. Each machine is provided with an independent blower set, driven by a low-tension motor for ventilating purposes, the cool air being led into the machine through ducts in the foundations and the heated air discharged, after passing through the machine, at the chimney opening above the stator.

The guaranteed temperature rise after a normal full-load

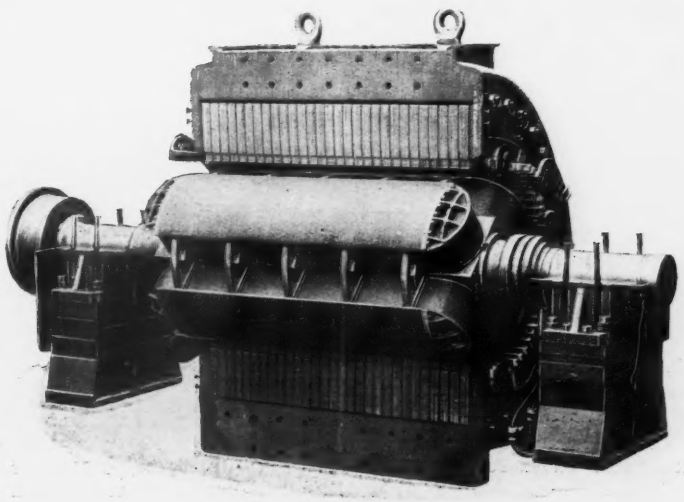


Fig. 3.—7,000-k.v.a. Turbo-Alternator, with Vertically-Divided Stator.

run of 12 hours will not exceed 45° F. above an air temperature not exceeding 77° F., and after a subsequent overload of 50 per cent. for two hours the temperature rise will not exceed 75° F.

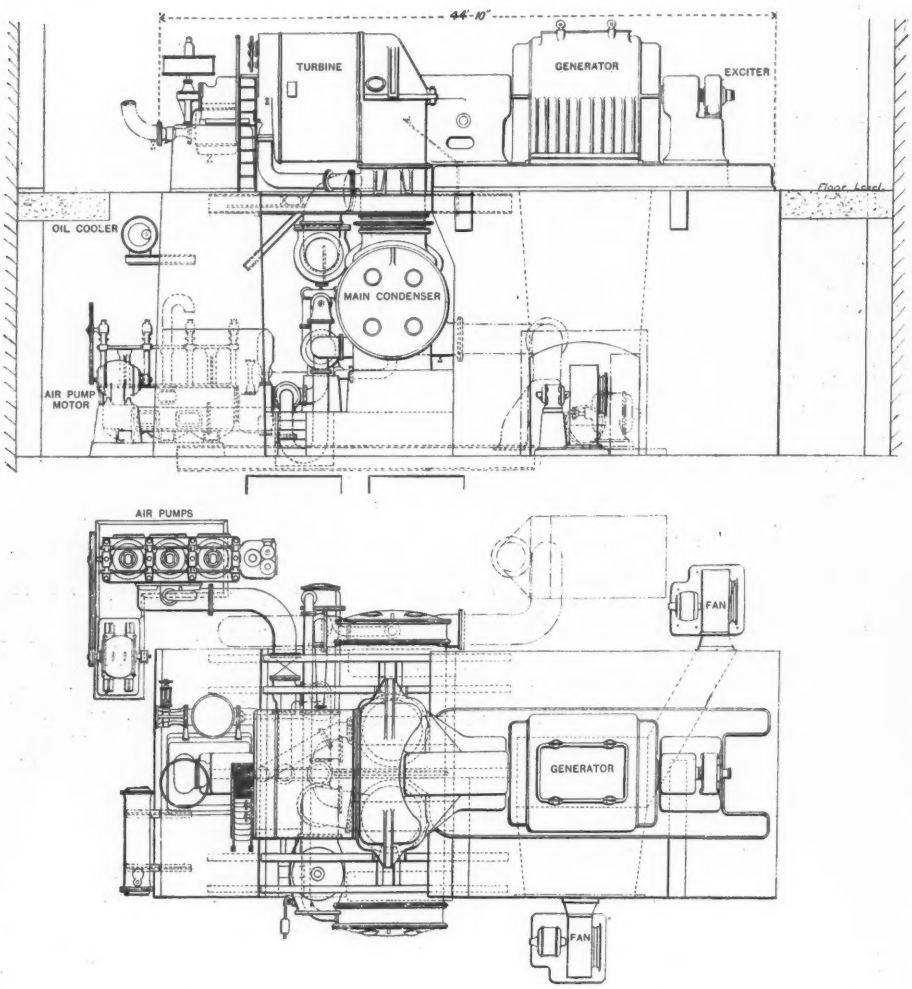


Fig. 4.—Showing Arrangement of 7,000-k.v.a. Willans-Dick, Kerr Turbine Unit for N.S.W. Railways.

The overload capacity of the machines is 25 per cent. continuously and 50 per cent. for two hours.

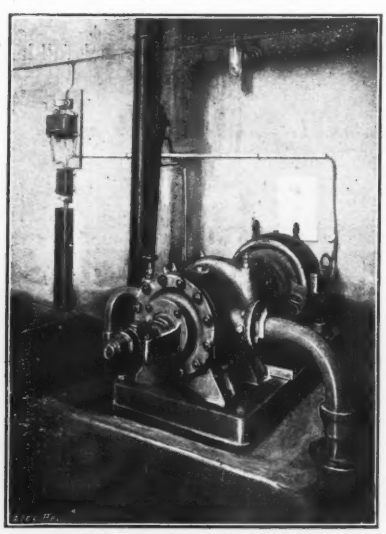
Fig. 3 illustrates one of the 7,000-k.v.a. White Bay alternators with half the stator removed.

We are indebted to Messrs. Willans for supplying us with the foregoing particulars, and to Mr. O. W. Brain, chief electrical engineer to the N.S.W. Government, for facilitating their publication. We understand that Messrs. Willans have in hand a number of other large disk and drum type turbines at the present time, including one of 8,500-kw. output for the Sheffield Corporation, and a 7,500-kw. unit for the Leeds electricity department.

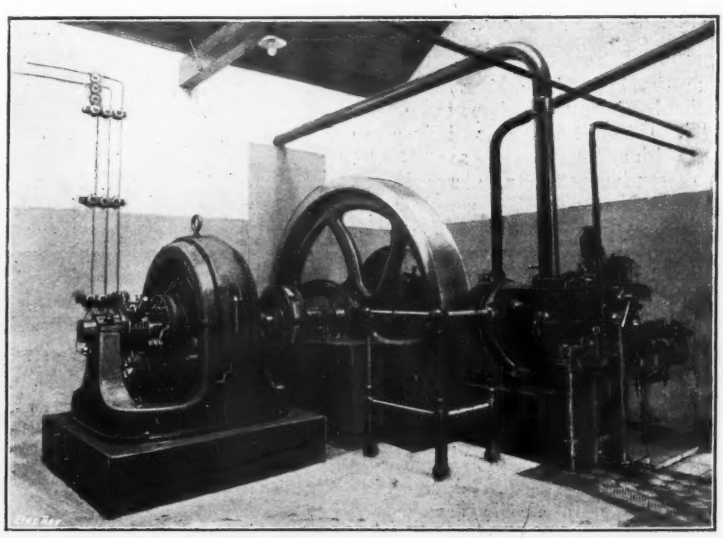
A KILKENNY ASYLUM INSTALLATION.

An electrical installation has recently been carried out at the Kilkenny District Asylum under the supervision of Louis J. Lawless, of Rathmines, to whom we are indebted for the following particulars regarding the work.

The generating plant comprises two 40-b.h.p. Hornsby Stockport gas engines and two suction gas plants, the connecting mains between the engines and plants being arranged so that either producer may be used to supply either engine. The engines are fitted with heavy fly-wheels carried in outer bearings, and are coupled direct through flexible couplings to



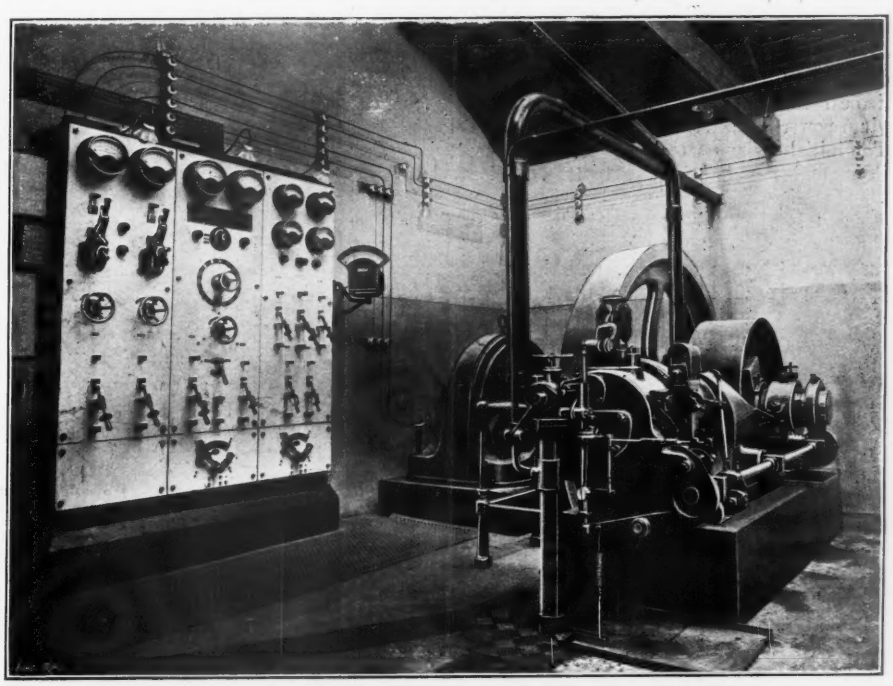
Electrically-Driven Pumping Plant.



Hornsby-E.C.C. Generating Set.

Kilkenny District Asylum Installation.

open type shunt-wound dynamos by the Electric Construction Co. Each set has an output of 25 KW. at from 220 to 240 volts. A D.P. storage battery has also been installed, having a capacity of 160 ampere-hours at the ten-hour rate, with a final voltage of 220. The cells are placed on single tier pitch pine stands supported on porcelain insulators on brick piers, and battery charging is carried out by a Newton motor-booster. A fine white marble panel switchboard by Messrs. Veritys, Ltd., and equipped with Elliott instruments is provided for the control of the generators, battery, &c., and asylum circuits. Separate fittings are provided for each circuit, including the main and auxiliary asylum buildings, pumping plant, laundry power plant and power house. The power house circuit is fitted with a switch and fuse only; the other circuits have an ammeter in addition, and the pump motor circuit also has a starting switch, shown on the bottom panel. The board is provided with a general service voltmeter mounted on the centre panel with a four-way D.P. switch, and a sector pattern voltmeter with an illuminated dial is mounted on a swinging arm at the right hand side of the board. All the main connections consist of bare copper conductors supported on porcelain shackles bolted to wrought-iron straps.



INTERIOR OF ENGINE ROOM, KILKENNY DISTRICT ASYLUM.

have proved groundless, and 20 and 30-watt Osram lamps have practically replaced the carbon lamps throughout; the life of the metal-filament lamps has been very satisfactory, some of the original ones being still in use.

The whole of the asylum wiring has been carried out with C.M.A. 600-megohm grade cables, run in whitewood casing in all positions except in the pump house, where steel tubing is adopted, carried on insulators.

The main conductors between the various buildings and the power house are lead-covered paper-insulated and armoured cables of Messrs. Glover's make, and are laid direct in the ground.

The laundry is driven by a 7-B.H.P. Siemens protected-type geared motor, and six electric irons have been provided. An 8-C.P. lamp is placed in circuit with each iron as a shunt,

FIG. 1.—MARBLE INSULATOR AND CONCRETE BASE FOR AERIAL TOWER.

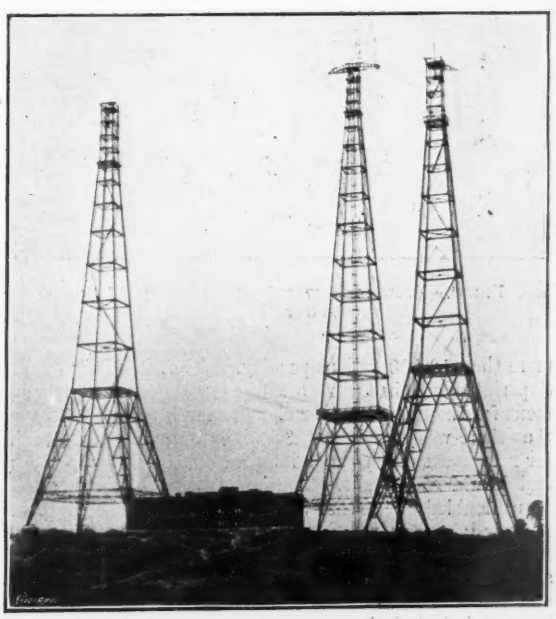


FIG. 2.—GENERAL VIEW OF STATION.

WIRELESS TELEGRAPH STATION AT FORT MYER, VIRGINIA. (See page 1002.)

The Asylum is wired for about 537 lamps. About 419 of these lamps were originally 8 and 16-C.P. carbon lamps, and the remainder Osram metal lamps, as it was anticipated that trouble from broken filaments would attend the adoption of metal-filament lamps throughout. These fears

at the point of connection with the flexible cord, to show when the current is on.

The pumping plant comprises two direct-coupled turbine pumps and motors of the Rees Roturbo type, each designed to deliver 2,000 gallons of water per hour to a height of 160 ft. The water is supplied from a well situated about 40 ft. below the level of the Asylum and about two-thirds of a mile distant from the main buildings. The pumps deliver into two 15,000-gallon storage tanks placed on towers at each end of the Asylum, about 90 ft. high. The motors require no attention beyond periodical inspection, and are controlled entirely from the Asylum power house switchboard.

The initial outlay on the complete equipment, including building and foundations, was £2,500. The fuel cost per annum for all purposes, including lighting, pumping, laundry power and ironing, only amounts to £60 when using Welsh anthracite at about 30s. per ton. The cost of gas previously was £360 per annum, and the coal for pumping purposes another £180, although the pumps were not giving

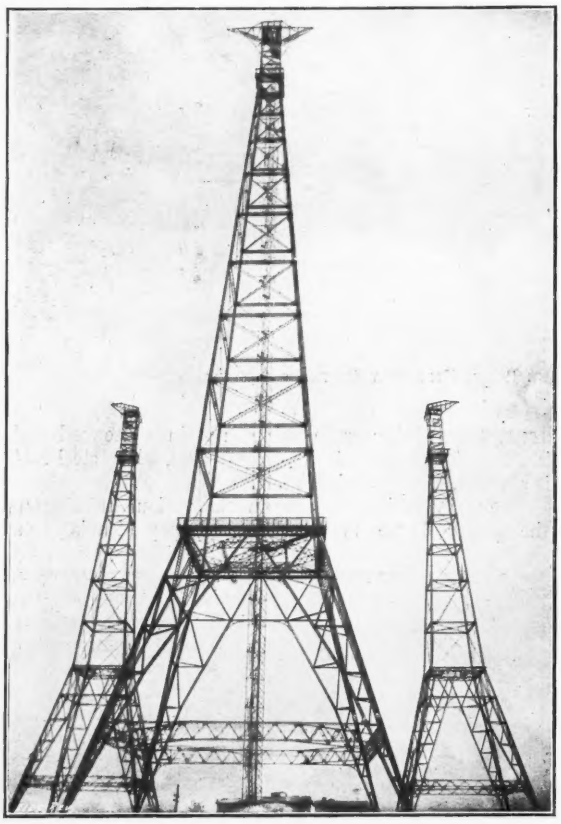


Fig. 3.—View of Tower Structures for Aerials, Fort Myer.

more than 12,000 gallons per day. The Resident Medical Superintendent, in his report to the Committee of Management for the financial year ending March 31st, 1912, stated that there was a saving of £165 per annum after allowing for repayment of loan and interest, cost of upkeep, running and insurance of plant. The illumination of the house has been doubled, and the water supply has been greatly increased.

The men who formerly had charge of the steam engines and boilers were trained to work the electrical installation, and the plant has now been in use for over 12 months. The whole installation, with the exception of the generating plant, was carried out by Messrs. Maguire & Gatchell, of Dublin; the engine and dynamo contract was given to Messrs. R. Hornsby & Sons.

Cardiff.—A L.G.B. inquiry was held on December 12th into the application of the T.C. for a loan of £7,672 for service transformers and additional plant. There was no opposition.

THE NEW WIRELESS TELEGRAPH STATION AT FORT MYER, VIRGINIA.

By DAVIS H. TUCK and MILLARD B. HODGSON.

Until quite recently, the United States and Italy, of all the important nations, were the only ones that had not

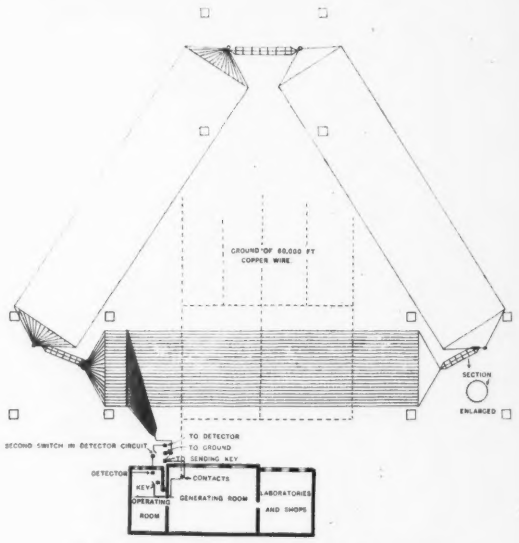


Fig. 4.—Plan of Station and Circuits.

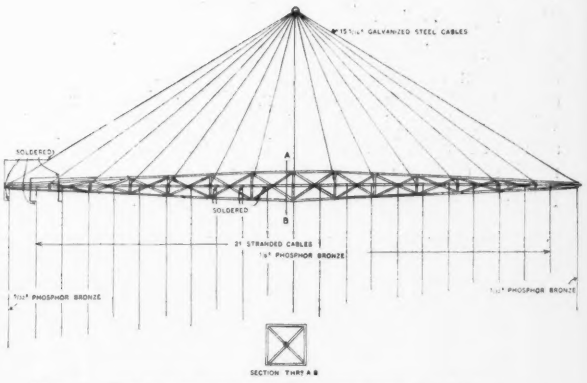


Fig. 5.—Diagram showing Construction of Aerials.

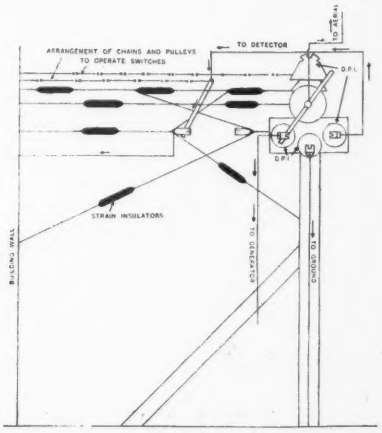


Fig. 6.—Arrangement of Switches on Distributing Pole.

installed Governmental coastal wireless telegraph stations with facilities for intercommunication with the mercantile marine. Although quite a number of private commercial stations had been established in the United States, these

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were operated with the single idea of business gain, were merely news channels for incoming and outgoing steamers, and rarely performed, except by special contract, the function of a distributor of general items, such as storm warnings, &c. Also, due to trade jealousy, little was attempted along co-operative lines; each company used its own system and each was free to give and receive as it pleased. This lack of co-operation was brought out very prominently at the time of the *Titanic* disaster. The few stations operated under the Federal Government confined themselves strictly to military and naval uses.

It is to meet this lack of co-operation that the Government of the United States, acting through the Navy Department, has installed at Fort Myer, Virginia, the wireless telegraph station described in this article. While primarily a naval order distributing centre, it has been designed to include a much greater range of activity. In addition to its use as a naval distributing centre, the equipment and facilities for an experimental station have been installed which, together with the practical working equipment, will be very valuable as a laboratory for the development and testing of new apparatus and appliances. This station, acting in conjunction with coastal stations, will also comprise a bulletin distributing bureau. At a pre-arranged time each day, notification of which will be made to the mercantile marine of all nations, news bulletins stating the bearings of ships, derelicts and icebergs (reported), together with storm warnings, will be sent out. Also individual reports of maritime interest will be recorded and sent out.

The station is situated just outside of Washington, D.C., in the Virginia hills, and is 150 ft. above the sea level. The entire plant, which comprises the laboratory and the three towers, occupies a federal reservation of about five acres. It was designed and built under the supervision of the Bureau of Yards and Docks of the Navy Department, the Baltimore Bridge Co. being awarded the contract for the erection of the three towers, and the Electric Signal Co., Pittsburg, Pa., supplying the special apparatus.

The three towers are built on the corners of an isosceles triangle, and are respectively 450, 450 and 600 ft. in height, the 600-ft. tower being erected at the apex of the triangle. The dimensions of the two smaller towers are identical, being 125 ft. sq. at the base, and tapering to 15 ft. sq. at the top. The 600-ft. tower is 160 ft. sq. at the base, and tapers to 15 ft. at the top. All three are of the same general construction (shown in figs. 2 and 3), being built up of box girders whose angles are of $\frac{1}{2}$-in. steel reinforced with $\frac{3}{8}$-in. plates. The platforms at the top are accessible by zig-zag ladders arranged with convenient landings. The four legs of each tower are embedded in a mass of concrete 10 ft. sq., running into the earth a distance of 12 ft. to a rock and clay sub-foundation.

The entire structures are insulated from the ground by marble washers waterproofed with varnish (see fig. 1). There being no reliable data on the possible effects of great electrical capacity, such as that of the towers, on the signalling devices, it was deemed advisable to take this precaution. The towers are connected to earth by ground wires and disconnecting switches, so that the above-mentioned data can be obtained.

The laboratory building in connection with the station was designed to meet the requirements of an up-to-date radio plant, including well-equipped research and testing laboratories. Space has also been included for a machine shop and dormitories for employés. On the first floor, occupying a space of about 2,400 sq. ft., is the generating room. At present the energy is supplied by a local power company at 6,600 volts, 25-cycle, three-phase, and is stepped down to a pressure of 220 volts to operate a Westinghouse synchronous motor rated at 200 H.P. at 500 R.P.M. This motor is separately excited by a direct-connected direct current generator. This direct-current generator-exciter is also used as a source of energy for auxiliary apparatus. The synchronous motor, which is first brought up to speed as an induction motor, is belt-connected to a Westinghouse 220-volt, 500-cycle, single-phase generator running at 1,250 R.P.M. The voltage of this machine is then stepped up to a working pressure of 25,000 volts. The revolving type of spark-gap is employed, being a 4-ft. wheel whose 50 terminal spokes, corresponding to the 50 poles of the generator, give 1,650 discharges per second. These pole spokes are $\frac{1}{2}$-in. copper, about 8 in. in length. Because of the great centrifugal force which their fastenings must withstand, life and apparatus are safeguarded by a 12-in. beam erected so as to repel any flying spokes. The minimum spark-gap is $\frac{1}{8}\frac{1}{4}$-in., but owing to the high potential the air breaks down about 3 in. before and after the $\frac{1}{8}\frac{1}{4}$-in. gap discharge. There is a constant capacity of a bank of nine condensers in parallel, each having a capacity of 0·036 mf. These condensers are made up of steel plates set in steel cylinders, and all air insulated at an air pressure of 300 lb. per sq. in. The wave length is varied by means of three variable-inductance units. These inductance units, together with the condenser apparatus, are the same that were formerly used at the Fessenden station at Brant Rock, Massachusetts. The signalling contacts are actuated from the operating room by relay, a variable resistance of 220 ohms maximum being shunted across the contact points on the low-voltage side to prevent excessive sparking at the contacts. The ground wires, which are led out through the basement, terminate in 6,000 ft. of bare copper wire laid in trenches between the towers. The generating or sending wires to the aerials are led out through a 1-in. thick window pane to a distributing pole (see fig. 6); this distributing pole is a very interesting and ingenious device. The sending wire from the generator, the receiving wire from the detector, and a third wire, deeply grounded, terminate here. The two wires from the generator and the detector respectively are heavily insulated from their wire supports by composition strain insulators, and from the posts of the distributing platform by double-petticoat porcelain insulators of special design. The terminals of these three wires form the three contacts of a three-way switch, which is controlled from the operating room by a system of chains and pulleys. The moving arm of the three-way switch is connected to the wires leading direct to the aerials. A second switch, suspended between the distributing poles and the wall of the building, but insulated from both by strain insulators, is placed in the detector side of the line. This switch is also actuated from the operating room by means of chains and pulleys. With this three-way switch arrangement it is obvious that the operator can at pleasure close the circuit for receiving messages, change over to sending them over the same route, or ground the entire system, as in time of electric storms.

The wires are run direct to the aerial spreaders in the manner shown in fig. 4. These aerial spreaders are built up (see fig. 5) of $2\frac{1}{2}$-in. galvanised iron pipe reinforced with $\frac{3}{8}$-in. strapping of galvanised steel. They are 88 ft. in length, square in section and 3 ft. on a side at the largest part. Their weight and that of the wires of the aerial is held up by a bridle of 15 $\frac{5}{1}\frac{5}{6}$-in. galvanised steel cables, connected to the pipe by turn-buckles, and terminating at the top in a 10-in. steel ring. The aerial wires proper, 23 stranded cables of $\frac{1}{8}$-in. diameter phosphor bronze, are soldered both directly to the iron pipe and by auxiliary wires to the bridle. These bridles are connected to and insulated from the trusses at the top of the towers by 10-in. buck links. The connections from one aerial to another are made by means of cages (see fig. 4). This cage contains 23 phosphor-bronze wires soldered directly to the bridles of the spreaders. Hence connections at any point are not dependent at any place on one strand or cable. The wires between the 600-ft. tower and the 450-ft. towers are about 400 ft. in length, and between the two smaller towers 300 ft., 40 ft. being allowed in each case for sag. It is estimated by needle-point test (length of spark being 11 in.) that an electromotive force of 150,000 volts is obtained at the topmost point of the antennæ. As an illustration of the great current density, a piece of cloth which was blown from the top of one of the towers and landed on the aerial, instantly burst into flame.

The operating room, situated on the first floor in the extreme southern wing of the building, is an example of all that is modern in receiving and transmitting devices. As outlined before, the telegraph key operates, by relay, the contacts in the generating room, which in turn control the rate at which the radiant energy leaves the aerials, the impulse being transmitted to the topmost antennæ from the spark-gap, and the wave-length being kept at the desired value by the variable inductance units.

The generating room when entirely equipped, in addition

to the apparatus already enumerated, will contain some novel features. To put an end to the dependency on the local power company, an internal-combustion engine will be installed. With this the officials in charge hope to do away with the somewhat elaborate spark controlling system now used, by being able to maintain a close regulation in the flow of current. In addition to this gas engine set, several small motor-generator sets will be available for lighting and storage battery systems, and also to operate a number of lines of 25, 40 and 60 cycles, as they may be needed, for laboratory experimental and testing purposes. The switchboard by which these changes can be made is the latest pattern of laboratory board of the plug type, and is thoroughly equipped with ammeters, voltmeters, frequency meters, &c. By the storage battery system any electromotive force of from one to 250 volts will be made available for laboratory use. A novel and useful item in the equipment of this room is the provision made for testing out complete generating sets for any of the Governmental stations. A space of about 20 ft. square is reserved, I beams being laid 3 in. apart in the floor, to which heavy apparatus, such as motors and generators, may be temporarily bolted. This testing platform will have a special switchboard and current distributing system, so that any desired voltage or frequency may be obtained.

With this magnificent equipment for both practical work and experimental endeavour, it is safe to say that the United States will soon be abreast of the European nations in the development of wireless telegraphy. Officials of the station hope to attain, when working at full capacity, a maximum range of from 3,000 to 4,000 miles. Already communication has been established with the Marconi station at Glace Bay, Canada, and the Naval station at Key West, Florida.

Up to the present time the Marconi stations at Glace Bay, Canada, and at Clifden, Ireland, both being nearly alike, signified the latest development in the wireless telegraph field. Those two stations with towers of 450 ft. have intercommunicated for some time. There has also been a German station at Nauen, with a mast of 450 ft., but little is known of what it has accomplished. Hence this station at Fort Myer, Virginia, with its 600-ft. tower, and its maximum range of 4,000 miles, should rank foremost among the recent radio developments.

NOTES.

(*Concluded from page* 998.)

Institution and Lecture Notes.—THE INSTITUTION OF ELECTRICAL ENGINEERS (STUDENTS' SECTION).—The ninth annual dinner of the Students' Section of the Institution of Electrical Engineers was held on Saturday evening last, the 14th inst., at the Trocadero Restaurant, Piccadilly Circus. Mr. J. C. Rennie, chairman of the Section, presided, and amongst others present were Mr. W. Duddell, F.R.S., President of the Institution, Mr. W. M. Mordey and Prof. Silvanus P. Thompson, F.R.S., Past Presidents; Messrs. A. Russell, J. Rennie, P. G. Bowie and S. A. Smith. Between 50 and 60 were present, and a very pleasant evening was spent; Mr. Fred Rome, in his humorous items, and Mr. Louis Nikola, in his repertoire of magical problems, were specially good. After the usual loyal toast, Mr. D. Betts, vice-chairman of the Section, proposed the toast of "The President and the Institution." Referring to Mr. Duddell as an example that all Students should try to copy, inasmuch as he had worked through all grades of the Institution, from Student to President, he pointed out that the Students were hoping for very sympathetic consideration of any requests they might make to the Council during his term of office. Mr. Duddell, in his reply, thanked Mr. Betts for his remarks, and urged all to do their best for the Institution. Every effort was being made to use the Institution for the best interests of the industry. An influential Business Committee had been formed on one side, and within the past week or two a Research Committee on the other. The aim of this Committee would be to co-ordinate as far as possible electrical research work. This would be of great use to Students, who might obtain valuable advice as to the direction in which they might usefully turn their energies. The President then referred to the changes now being made in the constitution of the Institution, and pointed out that the new Graduate Class was only intended as a temporary resting place in the progress from Studentship to full Membership.

The toast of "The Students' Section" was proposed by Mr. W. M. Mordey, who spoke of the importance of the Students' class, which numbered over 1,300, or one-fifth of the entire membership. He dwelt on the advantages which students obtained by association with the Institution, and urged all to see that they subscribed to *Science Abstracts*, a valuable publication for which the Institution was principally responsible. Mr. J. C. Rennie, the chairman of the Section, in responding, spoke of the advantages which the Students' Section gave not merely of a technical but also of a social character, Now that Local Students' Sections were in existence at Newcastle and Manchester there was growing up a healthy rivalry, and it might be that in future it would be possible to arrange social intercourse with them. All such joint action would be productive of good.

Mr. Moir, in proposing "The Colleges," coupled with the toast a warm eulogy of the work of Prof. S. P. Thompson, and the cordiality with which the toast was received spoke volumes as to the esteem and affection in which Dr. Thompson is universally held. Dr. Thompson, in his reply, spoke of the good work which so many of the small colleges in provincial towns were doing in training real electrical engineers. He then denounced the premium pupil system, which had done much in the past to keep good men out of the profession, and permitted incapable but rich men to enter. He was glad to know that some of the best up-to-date firms were now setting their faces against it, and in this movement he wished them every success. Dr. Thompson then spoke of the coming examinations for admittance into the higher grades of membership of the Institution. He pointed out that the aim of the examinations, as he understood it, would be to find out what a candidate knew, not what he did not know. They would be human in character, and should not frighten anyone from trying to pass them. Finally, Dr. Thompson referred to the fact that the Colleges at heart were the students, and that the students made the colleges. Without them, the colleges were mere buildings, mere staffs of professors. It needed the life and energy of the students to make them really live.

The remaining toast, that of "The Guests," was proposed by Mr. Mould, and responded to by Mr. P. G. Bowie and Mr. S. A. Smith.

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH SECTION).—There was a large and representative attendance at the annual dinner of the Scottish Local Section, held in Glasgow on Tuesday, December 17th. "The Imperial Forces" were proposed by Mr. Robert Caird, L.L.D., and responded to by Engineer-Commander Wood, R.N., and Sir George Thomas Beatson, M.D., K.C.B. Sir John Ure Primrose gave "The City of Glasgow," and Lord Provost Stevenson acknowledged. The toast of "The Institution of Electrical Engineers" came from the Bishop of Glasgow and Galloway, and Mr. Wm. Duddell, F.R.S., president of the Institution, replied; while the "Scottish Local Section" was submitted by Mr. R. K. Morcom, member of the Council I.E.E., and Mr. Wm. McWhirter, chairman of the Scottish Local Section, replied. There was a larger attendance than at previous functions, the company numbering about 300.

At a meeting of the Section held in Edinburgh on December 10th, Mr. F. Creedy read a paper on "The Turbo-Converter."

INSTITUTION OF ELECTRICAL ENGINEERS (DUBLIN SECTION).—On Thursday last week an informal paper was read by Mr. E. Handcock on "Illumination—Metal-Filament Lamp Lighting in relation to the Eye." A discussion followed, in which many members took part. It was decided that the day of meeting should be changed to the second Friday in each month.

ROYAL SOCIETY OF ARTS.—On December 11th Dr. F. Mollwo Perkin read a very interesting paper on "Natural and Synthetic Rubber," in the course of which he stated that when all the new sources of supply were in full swing there would probably be a glut of rubber on the market, unless new uses for rubber were found. The Badische Anilin und Soda-Fabrik had put aside £1,000,000 for research in connection with synthetic rubber. In the discussion, Mr. R. Kaye Gray pointed out that the raw rubbers differed in their properties according to their origin, and plantation rubbers had their drawbacks; they could not be expected to be absolutely uniform. He had no doubt that synthetic rubber would be produced in the future, but it would involve a great amount of work. Mr. W. F. de Bois Maclaren believed that plantation rubber would eventually be sold at 5d. a lb. Mr. W. F. Reid did not think there was a great future for synthetic rubber.

INSTITUTION OF ELECTRICAL ENGINEERS (MANCHESTER SECTION).—On Tuesday evening a paper was read on "Electric Welding," by Mr. P. Bucher; a discussion followed, to which the author replied.

SOCIETY OF ENGINEERS (INC.).—The third annual general meeting was held on Monday, December 9th. The report of the scrutineers of the postal ballot for the election of council and officers for 1912, showed that Mr. Arthur Valon had been elected President, and Messrs. H. C. H. Shenton, Norman Scorgie, and T. E. Bower Vice-Presidents. The President's gold medal was awarded to Mr. W. P. Durtnall, for his paper on "The Generation and Electrical Transmission of Power for Marine Transportation."

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON).—On Thursday last week a paper was read on "A Single-phase Motor with Pole-Changing Windings," by Messrs. J. S. Nicholson and B. P. Haigh, and a discussion followed. The annual dinner of the Institution will take place on Thursday, February 6th, at the Hotel Cecil.

The annual dinner of the LEEDS ASSOCIATION OF ENGINEERS was held on Saturday, December 7th; the sole subject of the speeches was the Leeds electricity supply.

BRIGHTON.—Mr. J. Christie, engineer and manager of the municipal electrical undertaking, on Monday delivered a lecture on "The Brighton Electricity Supply Undertaking" to the members of the Preston Literary and Debating Society. The conclusion was devoted to the advantages of the "Tricity" cookers and utensils, and afterwards an interesting demonstration was given.

Appointment Vacant.—Switchboard attendant, for the Corporation Electricity Works, Paisley (25s.). See our advertisement pages in this issue.

Fatalities.—A youth aged 14 years, named Harold R. Raymond, son of a farmer, of Erdington, near Birmingham, had been in the habit of making electrical experiments and giving himself light electric shocks in a bath. As a rule, he contented himself with a small battery, but on Saturday he fixed his wires to the electric light apparatus and got into his bath, and was afterwards found dead. At the inquest it was stated that the pressure was 230 volts. A verdict of "Accidental Death" was recorded.

According to *Lloyd's* newspaper, Mr. Thomas Smith, traction inspector of the electrified section, was knocked down by a train and killed while crossing the line on the elevated electric line of the London, Brighton and South Coast Railway, in the vicinity of the workshops at Peckham Rye Station on 14th inst.

Physical Society Exhibition.—On Tuesday last the Society's annual exhibition of electrical, optical and other apparatus was held at the Imperial College of Science. The number of exhibits was less than usual, but several very interesting novelties were shown, and will be described in our later issues.

A Christmas "Caution."—The British Fire Prevention Committee has issued a timely "Caution" as to certain fire dangers common to the festivities of the Christmas season, such as entertainments and parties; Christmas trees are fruitful sources of fires, as well as paper lanterns, tissue paper, cotton wool and celluloid, and children especially are liable to dangerous accidents at this time. Copies of the "Caution," in packets of 10, 25 or 50, will be provided free upon written application to the offices of the Committee, 8, Waterloo Place, London, S.W.

Educational Notes.—As will be seen from an announcement in our advertisement pages, the new course at the Crystal Palace School of Practical Engineering will commence on January 8th.

BATTERSEA POLYTECHNIC.—Mr. Edwin Tate, J.P., has given to the Battersea Polytechnic the sum of £7,000, the interest upon £5,000 of this sum to be utilised for scholarships, and the interest upon the remaining £2,000 to be devoted to the purchase of books for the Tate Library, which was also given by the same donor.

Magnetic Sender for Wireless Work.—From small equipments, such as may be used in outlying stations and by explorers, &c., where accumulators cannot be conveniently charged and maintained, quite good wireless signals can be emitted by aid of a simple magnetic tapper. As early as 1855, Ruhmkorff observed that, under certain conditions, the sparks obtained from the secondary circuit of his induction apparatus were longer and more intense when the primary circuit was broken by hand than when a high-speed hammer break was employed. This phenomenon was attributable partly to incomplete saturation of the magnet core in the latter case (owing to the short current duration), and partly to the effect of "extra current" on closing the primary circuit. These facts are applied in the following apparatus:—

The core of a Ruhmkorff apparatus, without primary winding, is excited by a bundle of high-class permanent magnets (weighing a few pounds). To obtain a long spark from a light apparatus, the reversal of flux in the core must be as rapid as possible, the magnetising period must be as long as possible and the air-gap in the magnet circuit must be reduced to a minimum. A convenient arrangement is to place a number of highly saturated U magnets of decreasing perimeter parallel to each other and so as to form opposite poles in two straight somewhat divergent extensions. The ends of the magnets terminate in soft-iron blocks. This arrangement permits the core of the induction apparatus to lie between the two poles, and the core is provided at its ends with two pairs of iron arms, of which one surrounds the two poles at the end where the latter lie closer together and the other lies between the poles at the other end. This arrangement enables the magnetic circuit to be completed through the core, and practically the whole of the flux can be made to traverse the latter if care be taken that the movable arms make good contact with the magnet extensions. The displacement of the magnet core and arms, to reverse the direction of flux through the core, requires a certain expenditure of energy, but can easily be effected by hand.—*L'Elettricista.*

Trading with Russia.—A correspondent who has recently visited Russia sends us the following communication:—

In view of the large number of manufactories in Russia, and the large amount of money which appears to be available in that country, it seems strange that the quantity of electrical goods imported from this country should be so small. During a recent visit to Russia the writer looked round carefully for English electrical machinery, but, alas! "made in Germany" seemed to be the only label to be seen, the whole of the business being apparently in German hands. In vain was the name of an English firm sought for; not a single one was discovered, while Siemens & Halske, the A.E.G. and other German firms have branches there, and are doing a large and profitable business.

In the Cladó Egorivsky Mill, near Moscow, 2,250 H.P. was recently added, in three Diesel units of 750 H.P. each, by Sulzer, with generator and motors of German manufacture, and elsewhere the same thing is going on.

Naturally the writer made inquiry as to the causes of this exclusion of English goods, and found that the first reason was that English firms were not represented on the spot; the second reason, that they did not take the trouble to quote to the requirements even when large orders were in the market; and thirdly, when they did quote, their prices and terms of payment were not acceptable, as the competing German firms offered much better terms for payment, giving lengthened credit wherever asked for by a firm of repute.

As regards representation, the British firms expected to get a representative on terms that no one in Russia could or would accept, forgetting that, in the large centres, the cost of living is just double that in England, the standard being higher. They expect the agent to pay cash on B/L even on goods sent over for sale, instead of sending goods on consignment, to be paid for when sold.

What this means is not generally realised, but it amounts to this: On a 10 per cent. basis, an agent must do £12,000 to £15,000 per annum turnover to make the business worth his while, as his remuneration would have to be at least £600 to £800 per annum to allow him to live in such style as to aid him in obtaining business, while his office, showroom, travelling and other expenses would make a big hole in £500, and in the case of large contracts the expenses mount up enormously. The Englishmen employed at the mills must not use a restaurant or place of entertainment below a certain grade, and the cheaper cafés are practically barred to them; and this applies to commercial agents equally, as it is only in the first-class places that the buyers can be seen outside of their own offices.

Even when a British firm sends over a representative, he is seldom familiar with the language, manners or customs of the Russian; his catalogues are in English, list prices, weights and measurements are in English also, and when he has departed, they are seldom again referred to, the metric system and home currency as used in the catalogues issued by German houses getting at once that preference which comes from familiarity.

Finally, there is the question of bribery, direct and indirect, on a scale hardly understandable here, and without which doing business is well-nigh impossible.

Tramway Social.—The Lancaster Electrical and Tramways staffs held a social evening the other day in the Alexandra Hall, 120 being present, including the Mayor and Mayoress and Councillor T. Wilkinson (the new chairman of the Tramways Committee). Mr. Milnes, electrical engineer, acted as chairman of the Organising Committee.

Electricity Applied to the Finding of Lost Pipes.—It has been a common experience in the older towns that metallic pipes which have been useful in their day have been discarded, and after their abandonment have been lost. Moreover, even if they are still in use it sometimes occurs that accurate plans have not been kept during the process of laying the pipes, with the result that when it becomes necessary to determine the position underground of the pipe service, even the most important pipes are sometimes situated at positions varying somewhat from those at which they were expected to be. In the case of extensions and street improvements, this sometimes leads to difficulty, and it is, therefore, interesting to hear that a device well-known to mains engineers has been usefully applied to the purpose of detecting the position of pipes underground, and has been adopted by a considerable number of water companies and gas companies in the United States, as well as by the Water Department of the United States Government at Washington. The principle which the Modern Ironworks, of Quincy, Ill., the manufacturers of the apparatus, have adopted depends on the fact that a conductor carrying an intermittent electric current is surrounded by a magnetic field, and if a coil of proper construction is brought within this field an electrical current is induced in the coil. If the coil is connected to a telephone receiver, the effect of the current is manifested by a sound produced in the receiver. Moreover, the nearer the coil is brought to the conductor the louder is the tone. The pipe localiser consists of a specially formed vibrator and induction coil placed in an oak box, provided with a space for the battery; this part of the apparatus is designed to produce the necessary current in the lost pipe. A specially-constructed detector coil and receiver is provided for tracing the circuit. Supposing, for example, that it is not known to which main a service pipe is attached, which supplies a particular house on a street corner. The circuit is formed by connecting the instrument on one side to the house service and on the other to, say, the nearest fire hydrant. On closing the battery circuit the current flows through a certain area underground, and anywhere in the field formed by the pipes and the wires the tone can be heard by the operator so long as he carries the coil parallel to the ground and applies his ear to the detector telephone. In passing over the service pipe or main an abrupt change in the tone is noticeable; stopping where this change takes place, the operator will be found to be standing almost directly over the pipe. By this means it has been made possible to find pipes which were buried more than 15 ft. underground, while pipes in walls or floors are easily found. For general street work the device is obviously of considerable use, as it will find pipes without pulling up the pavement and digging for them.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Two switchboard attendants have been appointed to the Portsmouth Corporation electric lighting department following on the recent advertisement, namely, MR R. L. AXFORD, formerly of the Bradford electricity works, and MR. W. TAYLOR, formerly of the Manchester electricity works.

MR. WILLIAM JONES, superintendent at the Valley Road Electricity works of the Bradford Corporation, has resigned his position owing to ill-health, and MR. FAIRBURN has been appointed to succeed him. MR. Jones has been with the electricity department since it commenced operations 23 years ago.

Tramway Officials.—Mr. BINNS, the retiring engineer and manager of the Reading Corporation tramways, has been presented by the borough officials with an engraved silver salver and silver tea tray, and by the workmen of the tramway department with a set of gold cuff links and gold studs. As announced in the ELECTRICAL REVIEW, Mr. Binns is leaving for Brazil.

General.—On Thursday last week the engineering staff, past and present, of the City of London Electric Lighting Co., entertained MR. FRANK BAILEY, the chief engineer of that company, to a complimentary dinner at the Waldorf Hotel. The company, which included a number of the contractors intimately connected with Bankside in the past, totalled 70 odd, was presided over by Mr. R. A. Chattock, chief engineer of the Birmingham Corporation electric supply department. Among those present were Sir Alexander Kennedy, Bart., Mr. S. Z. de Ferranti, Mr. J. H. Rosenthal, Mr. A. L. C. Fell, Mr. G. Nisbett, Mr. A. Bruce Anderson, Mr. J. C. Bull, Mr. A. F. Harrison, Mr. F. J. Walker, Mr. S. Dobson, Mr. H. W. Kolle, Mr. T. Browett, and Mr. F. H. Jackson. Sir Charles Parsons, Mr. W. W. Blunt and several others wrote expressing regret at their inability to attend. Mr. Chattock was in quite his best form, and the proceedings went with a splendid swing. In proposing the guest of the evening, Mr. Chattock recalled first meeting Mr. Bailey 23 years ago, and being put through the mill. Those were the days of colossal difficulties, but in spite of these, Mr. Bailey had always been a friend to the men under him, and had done his best to give them good advice. Mr. Bailey also had a wonderful personality with the directors of the company, and obtained their complete confidence even during the times when interruptions of the supply occurred almost daily. He regarded Mr. Bailey as one of the generals of the industry, for he had carried his plans through with complete success, as witness the position of the City of London Electric Lighting Co. to-day. The presence of Sir Alexander Kennedy reminded him of the D.C., A.C. controversy, when D.C. stood for "doubtful continuity" and A.C. meant "all correct." Singularly enough, the years had completely reversed the positions of the then champions of the two systems, Mr. Bailey being now for D.C. and Sir Alexander for A.C. Mr. Chattock recalled the manner in which Mr. David Wilson used to handle the boiler plant. At the conclusion of his speech, Mr. Chattock presented Mr. Bailey with a handsome solid silver tea tray as a token of the esteem and regard in which he is held by past and present Banksiders. The toast of Mr. Bailey's health was then drunk with great enthusiasm. Mr. Bailey, in reply, said that it had always been an honour and pleasure for him to work with the members of the Bankside staff, and he felt that his was a difficult task to thank them appropriately for their magnificent present. He would cherish it in memory of that occasion, and of their many agreeable associations in the past. He could not help feeling that he had done nothing especially to deserve such a gift, nor was it yet his intention to retire from active service. Recalling the troublous times of pioneering they only seemed like yesterday. He remembered the incident in which Rothschild's Bank, in St. Swithin's Lane, was nearly burned out through a short on a small length of bitumen cable and how the authorities warned them to be careful what they were doing. The staff at Bankside were then experts in spectrum analysis, and when a flash occurred would remark quite casually, "Ah! that's an armature by the colour." The relieving watch always inquired anxiously how many machines were left, and they never received the same answer. In all those trials and difficulties he always had had the cordial sympathy of the entire staff, and was greatly encouraged by it. But many things were done then which would not be dreamed of now. The City Company was, he believed, the only one which ever signed a contract and drew up a specification afterwards. This had actually happened in General Webber's day. The chief difficulty with which the company had always been confronted was the procuring of plant of the required size. Mr. Ferranti had proved of great assistance then, not only in the way of big units of his own, but in rebuilding the coils on other machines. In switchgear also Mr. Ferranti had replaced inadequate designs and saved the concern from a disastrous end. Mr. Bailey humorously described the Ferranti engines at Bankside as "a sort of fair," and said that the valves never missed whatever else happened. The Ferranti plant was still at Bankside because all the heavy parts were shrunk together and could not be taken to pieces. They were the despair of metal merchants, who could make offers but could not get the plant away. Mr. Bailey's speech was bristling with many other humorous incidents, which amused the company immensely. In conclusion, Mr. Bailey remarked that he hoped to continue to carry on the good work of the City Co. In response to the toast of "The Visitors," proposed by Mr. A. F. Harrison, Sir Alexander Kennedy referred to the pleasure it gave him to join in the expressions of esteem and affection for Mr. Bailey which had been voiced that evening. Speaking of the "battle of the systems," he thought that experience had proved the wisdom of combining them, and he suggested that "absolutely complete and devilish current" would describe that combination. Mr. J. H. Rosenthal (Babcock & Wilcox) proposed "The Bankside Staff, Past and Present," and recalled the interesting fact that 12 of the old members held positions as the chief engineers in important electric supply undertakings and two had joined his own staff. Mr. F. Jackson replied and was amusingly reminiscent, recalling the proud feeling with which the H.T. amperes used to be read with a magnifying glass. He also mentioned an incident in which a driver reported the vacuum had escaped, and was last seen near No. 4 machine, slightly blue in colour! Mr. Ferranti was also very amusing in his proposal of "The Chairman." He said that, as a contractor, he had to try and make money but it was Mr. Bailey's fault if he had not done so. He eulogised the good work which Mr. Chattock had done both during and since the days of Bankside, and referred to the geniality with which he had presided over the evening's proceedings. An excellent concert programme was gone through after the dinner, and the gathering broke up at a late hour. A hearty vote of thanks was given to the Committee and hon. secretaries, Mr. F. Sumner-Smith and Mr. P. F. Rycroft, for the work which they had done in organising the party.

MR. F. W. COOKE, M.I.E.E., is retiring from the Great Northern Railway Co.'s employ at the end of this month, after 43 years' continuous service as head of the technical staff and assistant superintendent of the telegraph department. He is commencing business immediately as consulting engineer and electrical expert, with offices at 50, London Road, Retford, Notts., where he will be glad to receive communications. Mr. Cooke will be remembered by some of our readers in connection with the early experiments in, and introduction of, train lighting by electricity on the Great Northern Railway during the eighties, also in the electrical interlocking of blocks and signals, and various other applications of electricity to railway working.

The staff of the Corporation Electricity Works at Peterborough has presented a framed photograph of the whole of the electricity undertaking to ALD. CLIFTON, chairman of the Electricity Committee.

MR. W. F. LLOYD, who has resigned his position with the Coatbridge and Airdrie Electric Supply Co., to take up an appointment at the steelworks of Messrs. Wm. Beardmore & Co., of Parkhead, near Glasgow, has been presented by his colleagues with a gold watch.

MR. ERNEST TAYLOR, of the electrical staff at Denaby Main Colliery, has been appointed chief electrician at the newly developed Rossington Colliery, near Doncaster.

SIR CLARENDON HYDE has been elected a director of the Metropolitan Railway Co., and MR. PAUL SPEAK has been elected deputy-chairman.

The Western Union Telegraph Co. have appointed MR. STANLEY J. GODDARD, lately general superintendent of the National Telephone Co., Ltd., to be their European representative. Mr. Goddard, who will exercise general control of the business in Europe in connection with the Western Union Atlantic Cables, will have his office at 26, Old Broad Street, E.C.

MR. FRANCIS POLLARD, of Preston, has been appointed electrical and mechanical engineer at Salford Infirmary.

NEW COMPANIES REGISTERED.

Electric Tramways of Ribeirao Preto, Brazil, Ltd. (125,780).—Registered December 7th, by G. W. Grice Hutchinson, 30, Bedford Row, W.C. Capital, £210,000 in 200,000 preferred ordinary shares of £1 each, and 200,000 deferred shares of 1s. each. Objects, to construct, purchase, lease or otherwise acquire any tramway or tramways in the State of Sao Paulo, Brazil, to equip and work the same by electricity, steam, oil, horse or other power, and in particular to enter into an agreement (the parties to which are not named), for the acquisition of a business of tramway proprietors at Ribeirao Preto, in the said State. The signatories (with one share each) are:—A. J. Hughes, 1, Pump Court, Temple, E.C., barrister; H. Burnett, 13, Featherstone buildings, E.C., engineer; W. Gwyn Jones, 55, Chancery Lane, W.C., company secretary; A. R. Pratt, 81, Goldsmith Avenue, Manor Park, E.; F. W. Roser, 221, Earlsfield Road, S.W., law stationer; H. J. Thornborrow, 8, Belgrave Street, King's Cross, W.C., law stationer; W. H. Masters, 27, Urlmington Square, W.C., gentleman. Minimum cash subscription, £100. The first directors (to be not less than seven or more than 11) are to be appointed by the signatories: qualification, 100 shares; remuneration, £200 each per annum. The company may pay underwriting commission not exceeding 25 per cent. to the nominal value of the shares.

Thistle Syndicate, Ltd. (8,464).—This company was registered in Edinburgh on December 6th, with a capital of £1,000 in 250 preferred ordinary and 750 deferred shares of £1, to carry on the business of makers of electrical appliances, machinery, &c. The subscribers (with one share each) are:—C. Robinson, Beechworth, Dunoon, engineer; H. M. MacCallum, 175, St. Vincent Street, Glasgow, consulting engineer. Private company. The number of directors is not to be less than two or more than four; the first are not named. Registered office, 37, Bank Street, Kilmarnock.

Gleeson O'Dea & Co., Ltd. (3,917).—This company was registered in Dublin on December 2nd, with a capital of £5,000 in £1 shares, to acquire and carry on the business of ironmongers, electrical engineers, &c., carried on by Gleeson O'Dea & Co., at 21 and 22, Christchurch Place, and 2, Werburgh Street, Dublin. The subscribers (with one share each) are:—J. O'Dea, 162, Capel Street, Dublin, ironmonger; J. A. Foley, St. James, Kilmanham, Dublin, ironmonger; K. O'Dea, South Circular Road, Dublin, book-keeper. Private company. The number of directors is not to be less than three or more than five; the first are J. O'Dea, J. A. Foley and K. O'Dea; qualification, one share. Registered office, 21 and 22, Christchurch Place, Dublin.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Krupka & Jacoby, Ltd.—Particulars of £8,000 debentures, created November 26th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, including uncalled capital. No trustees.

Sunderland District Electric Tramways, Ltd. — A memorandum of satisfaction in full on December 2nd, 1912 (*a*) of charge dated December 14th, 1906, securing £20,000, and (*b*) of mortgage or charge dated May 29th, 1908, securing £20,000, and (*c*) to the extent of £40,000 on same date of mortgage and charge dated December 8th, 1908, securing £100,000, notified. Particulars of first mortgage income bonds not exceeding £72,000, created December 2nd, 1912, also filed, pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £70,074 18s. 1d. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. Particulars of second income bonds, not exceeding £12,000 created same date, also filed pursuant to same section, the amount of the present issue being £11,241 6s. 1d. Property charged: As above. No trustees. Particulars of £30,000 prior lien debentures, created December 2nd, 1912, and secured by trust deed of even date also filed, pursuant to same section, the amount of the present issue being £20,000. Property charged: The company's undertaking and property, present and future, including uncalled capital; interests in the Houghton-le-Spring District Tramway Order: land in Newbottle, benefit of agreements, and the company's undertaking and property, present and future, including uncalled capital. Trustees: F. Last, 7, Norfolk Place, S.W.; and G. Cursons, Grove Park, Chiswick.

Vaughan & Son, Ltd. (61,526).—Capital £50,000 in £1 shares (20,000 preference and 30,000 ordinary). Return dated August 21st, 1912. 16,380 preference and 26,789 ordinary shares taken up. £43,169 paid. Mortgages and charges, £5,000.

W. R. Sykes Interlocking Signal Co., Ltd. (93,078).—Capital £50,000 in 87,500 "A" and 12,500 "B" shares of 10s. each. Return dated October 2nd, 1912. 42,297 "A" and 12,500 "B" shares taken up. 8s. 9d. per share called up on 42,297 "A," £7,986 18s. 9d. paid. 10s. per share considered as paid on 12,500 "B" (£6 250) and 5s. per share on 42,297 "A" (£10,574 5s.). Mortgages and charges, £15,000.

Pirelli, Ltd. (103,068).—Capital £8,000 in £5 shares. Return dated October 7th (filed October 14th), 1912. All shares taken up. £8,000 paid. Mortgages and charges, nil.

Grindell-Matthews Wireless Telephone Syndicate, Ltd.—Particulars of £3,300 debentures, created November 28th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £2,500. Property charged: The company's undertaking and property, present and future. No trustees.

Pontelec Welding Patents, Ltd.—Issue on November 22nd, 1912, of £300 debentures, part of a series of which particulars have already been filed.

Egham and Staines Electricity Co., Ltd.—Issue on November 28th, 1912, of £500 debentures, part of a series of which particulars have already been filed.

James Keith & Blackman, Ltd.—Particulars of £10,000 second debentures, created November 18th, 1912, and secured by trust deed of even date, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908. There is no issue at present. Property charged: The company's undertaking and property, present and future, including uncalled capital of various properties in Forfarshire and London. Trustees: Sir Francis Webster, Kt., and W. K. Macdonald.

Yarmouth (I.W.) Electricity Supply Co., Ltd. (56,884).—Registered April 7th, 1898; capital, £5,000 in £1 shares return dated October 31st (filed November 7th, 1912); 361 shares taken up; £1,805 considered as paid. Mortgages and charges: Nil. Registered office, Yarmouth, I.W.

Pacific and European Telegraph Co., Ltd. (36,683 C.).—Capital, £100 000 in £10 shares; return dated November 26th, 1912 (filed November 28th, 1912); all shares taken up; £4 per share called up; £40,000 paid. Mortgages and charges: £72,400.

A. S. Cartwright, Ltd.—Charge on 75 and 76, Ford Street, Hockley, Birmingham, dated November 28th, 1912, to secure all moneys due or to become due from the company to United Counties Bank, Ltd., 63, Colmore Row, Birmingham.

Rhondda Tramways Co., Ltd.—A memorandum of satisfaction to the extent of £2,800 on November 28th, 1912, of charge dated March 24th, 1911, and November 13th, 1912, securing £240,000, has been filed.

Johnson Secret Wireless Telegraph and Telephone Testing Syndicate, Ltd.—A memorandum of satisfaction in full on November 26th, 1912, of debenture dated February 20th, 1911, securing £100, has been filed.

Yorkshire Cable Co., Ltd. (99,015).—Return dated October 28th, 1912. Capital £5,000 in £1 shares. 2,422 shares taken up. £2,422 paid. Mortgages and charges, £1,200.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

Calgary Power Co., Ltd.—Further issue of £31,000 5 per cent. 30-year first mortgage bonds of £100 each.

Toronto Power Co., Ltd.—Further issue of £619,315 4½ per cent. consolidated guaranteed debenture stock.

The Committee have (1) appointed special settling days as under:—

Friday, December 20th.—General Electric Co.—Scrip, fully paid, for $4,000,000 5 per cent. gold debenture bonds (London issue).

Sao Paulo Electric Co., Ltd.—Scrip, fully and partly paid, for £1,880,000 5 per cent. 50-year first mortgage bonds.

And (2) ordered the undermentioned securities to be quoted in the Official List:—

Canadian Western Natural Gas, Light, Heat and Power Co., Ltd.—Further issue of £113 013 5 per cent. first mortgage debenture stock.

General Electric Co.—Scrip, fully paid, for $4,000,000 5 per cent. gold debenture bonds (London issue).

Sao Paulo Electric Co., Ltd.—Scrip, partly paid, for £1,880,000 5 per cent. 50-year first mortgage bonds.

Yorkshire (West Riding) Electric Tramways, Co., Ltd.—The Transfer Books, so far as they relate to 6 per cent. cumulative preference shares, are closed to December 31st. Dividends will be payable on January 1st.

CITY NOTES.

Melbourne Electric Supply Co., Ltd.

THE report of the directors for the year ended August 31st (as printed in the *Times*) states that the balance of the company's holding of ordinary shares in the Adelaide Electric Supply Co. has been disposed of during the year at satisfactory and advancing prices; the total net profit so realised amounting to £30,381. The increasing prosperity of the company enabled the directors to conclude an arrangement in January last for the sale of the unissued balance of £125,830 consolidated ordinary stock at a price equal to par net to the company. Before the close of the year under review, the whole of such stock had been allotted and paid for in full. By arrangement with the holders of the above stock, they will waive the undermentioned final dividend, receiving in lieu thereof interest at 1 per cent. above bank rate for an agreed period. The saving thus effected enables the board to recommend a bonus of 1 per cent., free of tax, on the consolidated ordinary stock, which, with the final dividend of 5 per cent., makes a total dividend for the year of 8½ per cent., free of income-tax. The proceeds of these transactions enabled the temporary loans from the company's bankers to be paid off; provided the funds necessary to cope with the expansion of the company's undertakings at Melbourne and Geelong; and at the close of the financial year left a balance in hand of £78,242 available for further capital expenditure. The profit and loss account shows that the gross profit derived during the year from the Melbourne and Geelong undertakings, including the Geelong tramways, was £56,272. After payment of management and general expenses at the London head office, together with interest on debenture stock and temporary loans, &c., and after placing to depreciation and general reserve £10,860, there remains a credit balance of £24,892, to which has to be added £5,207 brought forward, making a total of £30,100. After paying the dividend and bonus there will remain £5,585 to be carried forward. With regard to the profit of £30,381 realised on the sale of the company's holding of Adelaide shares, the directors have added thereto £46, representing the difference between the purchase price and par value of debenture stock redeemed during the year; and they recommend that out of such fund a sum of £10,287 be applied in writing off certain items in the Melbourne and Geelong accounts, and that the balance of £20,140 be added to the depreciation and general reserve account, making a total addition to the latter of £31,000, and thereby raising it to a total of £55,000.

In the tables of progress the following figures appear:—

Date.	No. of consumers.	Lighting in KW.	Motors in rated H.P.	Total equiv. connections expressed in KW.	Total units sold.	Gross profit.
MELBOURNE—						
August 31st, 1910	3,005	4,097	3,688 H.P.	7,576	3,394,525	£19,279
" 1911	5,076	5,680	5,196 "	10,668	5,099,162	33,226
" 1912	8,696	8,282	7,453 "	15,735	7,082,871	50,281
GEELONG—						
August 31st, 1910	726	1,013	994 H.P.	1,918	413,101	£2,022
" 1911	864	1,138	1,133 "	2,225	506.267	3,206
" 1912	1,099	1,453	1,380 "	3,049	753,611	5,251

In the case of Melbourne, the number of consumers has increased by 71 per cent., the total connections by 47 per cent., the total units sold by 38 per cent., and the gross profit by 51 per cent., as compared with the previous year. Further illustration of the development of the Melbourne undertaking is afforded by graphic curves. Orders in Council for the supply of electricity in the Melbourne suburbs of Sandringham, Hampton and Oakleigh, have been granted to the company during the year, and distributing mains are being laid in these districts. The Geelong undertaking also shows satisfactory growth, and the directors are pleased to say that the small system of electric tramways at Geelong, a portion of which was opened for traffic in March last, is working well, and already shows a small profit. The remaining section of the lines—viz., that to South Geelong—which, owing to circumstances beyond the control of the company, could not hitherto be proceeded with, is now under construction; and the directors anticipate that the completion and opening of the same will materially increase the traffic returns.

The shareholders at the meeting on Monday next will be asked to pass two resolutions increasing the number of directors from five to six, and also increasing the remuneration of the directors.

It is intended to nominate Mr. Benjamin Brookman for election as the sixth director.

Central London Railway Co.—The directors have sent a circular to stockholders inviting them to take in exchange for their stock an equal amount of a new stock to be issued by trustees against the deposited Central London stock, and carrying a dividend of 4 per cent. per annum, guaranted by the Underground Electric Railways Co., of London, Ltd., and a right to 40 per cent. of the amount paid in dividends on the nominal amount of the deposited stocks in excess of 4 per cent. in any year after the dividends received by the trustees on the deposited stocks for three successive years shall have exceeded an average of 4 per cent.

Alldays & Onions Pneumatic Engineering Co., Ltd.—For the past year the directors recommend a dividend on the ordinary shares at the rate of 5 per cent. per annum, and a bonus of 5 per cent. per annum, leaving to be carried forward £20,097.

Costa Rica Electric Light and Traction Co., Ltd.

The directors in their report for the year ended June 30th, 1912, which is to be presented at the annual meeting to-day, stated that the net earnings in Costa Rica, after charging all expenses incurred amount to £22,034, as compared with £18,451 for the previous year, being an increase of £3,582. The net surplus profit for the year is £5,732 (against £3,643 last year) and the directors propose to carry the whole of this amount to the credit of discount and commission on debenture issues account. At a meeting of the 5 per cent. debenture-holders, held at the offices of the company on June 24th, 1912, it was unanimously resolved to suspend the operation of the 1 per cent. sinking fund until the year beginning July 1st, 1916, the amount thus released to be applied to the development of the company's business. The number of lamps installed in the lighting department increased by 18 per cent. during the 12 months, and the motor supply by 55 per cent. The first section of the new power station at El Brasil was inaugurated in December last, and has been supplying electricity since that date, for all the purposes of the business, with entire success. As stated in the last report, the directors deemed it necessary to install a second pipe line, for safety's sake, and to increase the power of the station by enabling the management to run all the plant (three sets of 500 KW. each) at the same time, if required for peak load. This work has been carried out, and the danger of a breakdown through accident to one of the pipes reduced to a minimum. In view of the increased output of electrical energy demanded for tramway and power purposes, the installation of a second main feeder from the Anonos sub-station to the city of San José was found to be necessary. This work has been carried out at a cost of approximately £3,300, and three new cars have been purchased and delivered, costing about £2,600. To provide the necessary cash for the above-mentioned items, and for the installation of a fourth unit of plant, so as to utilise the full power of the second pipe line when needed, the directors have arranged for the increase of the loan, referred to in the last report, to £20,000, secured on the unissued 5 per cent. debentures, which the lenders have an option to purchase. The installation of the fourth 500-KW. set will mark the completion of a fully-equipped and homogeneous power station capable of supplying 2,000 KW. on an emergency at the switchboard—and with a reserve of water-power equivalent to a further 1,000 KW. available whenever the exigencies of the undertaking may demand the acquisition of further machinery to utilise it. The management of the business in Costa Rica continues to give the directors every satisfaction. During the year the gold premium has averaged 112½ per cent., as against 113 per cent. for the previous year. The general manager certifies that all buildings, machinery, plant and permanent way have been kept in good working order. The insurable buildings and machinery, including the new erections at El Brasil, and rolling stock are adequately covered against risk from fire.

Manx Electric Railway Co., Ltd.

The tenth annual meeting of the shareholders of the above company was held on Tuesday at the offices, 3, Finch Lane, E.C., Col. Sir A. G. Boscawen, M.P., presiding. The Chairman, in moving the adoption of the report, said that unfortunately they had had a very bad summer as regarded weather. He also rather thought that the resources at the disposal of the holiday making public were, in consequence of the strikes and lockouts which preceded the season, somewhat seriously crippled. He also pointed out that the counter attractions of up-to-date rival holiday resorts on the mainland might be responsible for the falling-off of visitors to the island. This fact was beginning to be realised in Douglas, and a committee was formed there last spring for the purpose of dealing with the advertising of the island. A fund was started called the "Chamber of Commerce Advertising Fund," to which they amongst others contributed handsomely, and of which committee their general manager was an active member. More than that might be done, as he had pointed out on former occasions, to make the island generally, and Douglas in particular, more up to date, and they could only hope that the powers that be might see their way to do this. The fact remained that a considerable falling off in the total number of visitors to the island, and consequently also in their passenger traffic, had to be recorded. He thought they might congratulate themselves that the consequences were not more serious, for when all was said and done the net result of the year's working, after taking into account the whole of the revenue from the various sources, and deducting working expenses, various depreciations as last year, debenture interest and interim dividend on preference shares, was only about £900 worse than last year, that was to say, with the carry forward from the previous year, they showed a balance on net revenue of £5,501, as against £6,456 last year. They proposed to apportion this balance as to £3,580 for final dividend on the preference shares; £1,000 as reserve for special renewals; and £920 as carry forward. Their reserve was thereby raised to £8,232, which was a considerable sum, but which he hoped to see increased within the next few years, both as a safeguard for their large debenture issue and as the nucleus of what he might call an insurance of their share capital. The official figures of visitors to Douglas between May and September gave 493,073, as against 540,067 in 1911, a decrease of 46,994, and the number of passengers carried on their lines totalled 574,187, as against 606,497 in 1911, a decrease of 32,310. He might, however, point out that although they had this decrease of 32,310 passengers carried, they were still 27,500 higher than the previous best, which was in 1907. The gross revenue amounted to £34,375, as against £36,013 last year, and the working expenses totalled £17,669, as compared with £17,214, an increase of £455 over last year. This increase, however, was largely accounted for by extra expenditure incurred in day work, &c., and from this source, goods traffic, &c., they actually had an increased revenue over last year of £615, which more than made up for the increased expenditure. The ratio of working expenses to receipts was 51·4 per cent., as against 47·78 per cent. last year, and 53·12 per cent. the year before. The mileage run was 325,640, as compared with 344,968 last year. Passenger traffic receipts per mile was 22·33d. this year, 22·64d. last year, or per passenger carried, 12·66d. this year, 12·88d. last year.

Sir W. H. Vaudrey seconded the motion.

Replying to a shareholder, the Chairman said he would be very unwilling to say to what figure they wished to get the reserve for special renewals before paying any dividend on the ordinary shares. It was most important for the financial position of the line that they should continue to build up that account, which was the best guarantee that when it had reached a certain amount, ordinary dividends would be paid. What they aimed at was thoroughly to maintain the line out of revenue, and in view of the fact that it was an electrical undertaking, and that heavy renewals might be required any day, they must have a substantial fund to fall back upon.

The report was adopted.

Tata Hydro-Electric Co.

The annual meeting of Hydro-Electric Power Supply Co., Ltd., was held recently in Calcutta, and is reported in the *Calcutta Statesman*. Mr. R. J. Tata presided, and said that the third report was a record of progress and construction, promising that power would be supplied to consumers at the date intended. "Construction costs will be higher than estimated. The estimates had been made in 1906, and since then land alone has gone up immensely in value. Our engineering advisers also, when they came to close quarters with problems, found it necessary to increase hydraulic quantities, and to make more expensive electric and mechanical recommendations. On the other hand, we are confidently advised that we shall get very good work. The demand for power has proved gratifying. The whole of the original installation has been sold; and it has been found necessary to contemplate a small extension at once if we are to meet the applications already made, and others apparently waiting for the extension. At first it looked as if outside the cotton mills there would be no demand for power, but recently negotiations seem to indicate the probability of substantial demand from other sources. Your directors have decided to apply for licence to supply power outside the Island of Bombay. Firm application for about 3,000 H.P. has already been received from the moffussil; and the promised electrification opens out an obvious market for your company's power. As you are aware, arrangements have been completed for the extra capital of 25 lakhs which the directors have found necessary to meet the cost of the small extension contemplated. For the present, nearly all the necessary orders have been placed for electrical material. Staff quarters, the power house, and the receiving station are being erected. The pipe line is being laid. The transmission line is in course of construction. Cables for feeder system have been laid; and the work at the Thana and Panval creeks has proceeded throughout the year."

The report was adopted. A dividend of 4 per cent. from the capital was declared.

Prospectuses.—*County of Dorset Electric Supply Co., Ltd.*—This company is inviting subscriptions for 51,000 ordinary shares of £1 each. The list opened on Saturday last and will close on Saturday, December 28th. The company proposes to commence business by giving a supply in Dorchester, Sherborne, Wimborne and District, Swanage, Blandford Forum and Lyme Regis. The prospectus mentions that competitive tenders were obtained for plant and mains for the towns affected other than Lyme Regis, and the lowest tenders complying with the specification had been provisionally accepted. The estimated capital expenditure at the end of the second year of working is £44,250, which includes £5,750 for the acquisition and development of the Lyme Regis undertaking. Messrs. J. & W. Purves are the promoters of the company. They will receive £2,000 in cash for their services in securing prov. orders and agreements; also 5 per cent. on plant, mains and apparatus capital expenditure for engineers' fees as the works are carried out.

Continental.—Belgium.—The balance-sheet of La Compagnie Belge d'Electricité Siemens-Schuckert, of Brussels, for the last financial year shows a profit of £3,264.

The report of the Compagnie Internationale de Lampes Electriques Zircone-Wolfram, of Brussels, for the financial year ending June 30th last, shows a loss of £29,167.

France.—The balance-sheet of La Société des Trefileries du Havre, wire and cable manufacturers, Le Havre, for the last financial year shows a net profit of £161,498, as compared with only £113,248 in the preceding 12 months.

La Société Manufacture Française de Lampes Electriques à Filament Etiré Incassable is the name of a new company which has lately been formed at Levallois-Perret (120 Rue de Courcelles) near Paris, with a capital of £8,400, to manufacture a new unbreakable metal-filament lamp.

Automatic Telephone Manufacturing Co., Ltd.—The dividend for the half-year ending December 31st inst. on the 6 per cent. preference shares has been declared, and the transfer books will be closed from 17th to 24th inst.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.

Major Darwin (chairman) presided on Tuesday at the offices, 106, Cannon Street, E.C., over the forty-ninth ordinary general meeting of the above company.

In moving the adoption of the report, the Chairman regretted that by inadvertence they had omitted a reference in the report to the death of Mr. P. M. S. Brodie, which took place in February last. Mr. Brodie at the time of his decease occupied the position of works manager at Silvertown. He was much esteemed by his co-workers in the company's service. He was glad to find himself before them under pleasanter circumstances than was his fortune at the last annual general meeting of the company, as the board on this occasion felt themselves fully justified in making the recommendation that the ordinary shareholders should receive a dividend of 7½ per cent. for the year. When the payment of a dividend to this class of shareholders was passed a year ago, every sympathy one could express was expressed; but the fortunes of war were against them. He pointed out at the time that in his opinion the stage they were passing through was quite abnormal, and that, although one could not prophesy as to dates, yet they felt sure that the normal condition would before long re-assert itself. The board were grateful to the ordinary shareholders for the manner in which they accepted the situation. It was, therefore, with all the greater pleasure that the board found they could recommend a substantial dividend to the holders of ordinary shares. The year under review had not, however, passed without its anxieties. The coal strike in March forced them to pay heavy prices for coal for a short time, as they had on hand work of a seasonal character, which could not be completely arrested. Even in spite of these costly purchases they were obliged to curtail their working hours at Silvertown. In July a London dock strike occurred. This strike interfered with the reception of raw material and the dispatching of manufactured goods. The result to them, however, was not so serious as it might have been had the general labour situation been quieter in the provinces, because their competitors established there did not have the whole advantage over them which they would otherwise have enjoyed. The raw rubber market had on balance been in their favour, but its uncertainty and the fluctuations it had undergone had made it a difficult factor in their calculations. He was glad to say the quality of their goods continued to command the respect of buyers, and that their turnover had increased during the year. In this connection they must ask the shareholders to commend to their friends the Palmer tire whether for motor, motor-cycle or bicycle. In the report it was stated that the trading of the French factory and some of the foreign agencies had not been satisfactory, while other foreign agencies had produced quite gratifying results. The foreign agencies, it must be remembered, were not so immediately affected by home disturbances as they were in Great Britain, though their markets were subject to local conditions. Their competitors might or might not be stocked with goods in these distant places, and on this to a great extent depended the result of the business done in each locality. He did not think it was in the company's interest to enter into too much detail on these questions, as it was manifest that if they were doing a fair business in any locality they should not draw too much attention to the fact, nor, on the other hand, did they wish to point out the places where things were less favourable. Indeed, with regard to many matters the position of a chairman of a manufacturing company was a difficult one, for although he wished to communicate to his co-shareholders as much information as he could, yet he must always have before him the fact that while his shareholders heard him, his company's competitors and those who dealt with the company as buyers and sellers had also the opportunity of hearing the information he gave, and the opinions he expressed. As mentioned in the report, they had just completed the laying of some 1,300 nautical miles of submarine cable for the Pacific Cable Board between Australia and New Zealand, and their staff had carried out the work with their usual efficiency and dispatch. They expected the *Silvertown* to sail from Australia about the middle of January, under charter. They regretted to say that local taxation at Silvertown was increasing again after a short period of some slight relief. They had, moreover, to face in the future charges under the Insurance Act, which were not inconsiderable, and increased premiums payable for insurance under the Workmen's Compensation and Employers' Liability Acts. Still, these extra charges were applicable to all home manufacturers, and would not unduly affect them prejudicially so far as the home competition was concerned. They found, however, that the increasing quantity of regulations and forms to be filled up was becoming rather a serious matter, and preoccupied the minds of those who should be engaged in the more useful work of attending to their business as manufacturers.

Mr. R. K. Gray seconded the motion.

Mr. Flint asked a question on behalf of Mr. Lloyd, whether there was an annual stock-taking and audit of the company's shops in provincial towns to ascertain whether they paid their way or not.

Mr. H. Sullivan inquired (1) Whether, in the agencies where losses had occurred, steps had been taken to reorganise them; (2) What were the separate amounts of each item under the heading "Debts and loan from bank owing by company, and amounts received on account of partly executed contract, £262,374"; (3) How much of the reserve fund of £400,000 was invested in the business of the company and how much in subsidiary companies; (4) How the value of shares in other companies was arrived at; and (5) What was the proportion of the freehold and leasehold property of the company.

Mr. Chabrington wanted to know to what extent the rates at Silvertown had risen, and if the company was affected.

Mr. Brook asked why there had been no depreciation on the steamships.

The Chairman, in reply, said that the ships had been heavily written down and were kept well under repair. They believed they were not shown at too high a price. With regard to the agencies, there had never been a case of want of organisation. It was only a case of some agencies not doing so well as others. The books of the agencies were closed on July 1st, and, consequently, they were somewhat more affected by the bad times which they had passed through. They always had their misfortunes in trade, but there was really nothing wrong in the agencies, although some had not done so well as they hoped they would in the future. The reserve fund was invested in the company's business. Most of the shares in other companies were mere cross entries in the balance-sheet. For instance, the Palmer Tire Co., of which they held $\frac{55}{60}$ths, appeared on both sides of the accounts, and, therefore, it was not a very material matter what value was placed on it. The shares were, to the best of their ability, valued at a figure at less than they were worth; but as the shares did not come into the market, it was impossible to get a fixed value for them. They had also investments in two electric lighting companies, whose shares were never in the market, but they were paying, and the shares were put in the accounts at less than value. He could not give the items as to freehold property, as it had not yet been valued, according to Form 4. The largest item in the not-completed contracts was the cable he had referred to which had been laid, and in a week's time they would receive payment for it.

Mr. R. K. Gray said the stocks in the home agencies were taken each year, but they had not large stocks, and there were always the stocks at Silvertown to fall back upon. The rates at Silvertown had been down to 9s. 4d., but this half-year's rate was 11s. 2d.

The report was adopted, and the Chairman was re-elected a director.

Mr. Flint brought forward a motion to the effect that in the future the directors' remuneration should bear a fixed relationship to the dividends paid. He disclaimed any idea of the motion being in the nature of a vote of want of confidence, but thought that such a sliding scale would encourage the directors to pay better dividends.

Mr. S. Sullivan seconded the motion.

Mr. E. J. Fox said he knew neither the directors nor the officials of the company, and had only recently become a shareholder. Before doing so he took the advice of the chairman of a concern which was one of the largest competitors of the company. That gentleman said to him, "In these matters you are in the hands of the directors, and if the directors wish to deceive you they can do so; but," he added, "There is no more honest company trading in Great Britain than the India-Rubber and Gutta-Percha Co., and you can take every item in the balance-sheet as not only being true but probably very much under-valued." He opposed the amendment.

The Chairman said the directors did receive extended remuneration when the profits rose above a certain point, but that was not payable on the amount of dividend paid. He agreed with what one shareholder had written to him, that to pay directors on the dividend declared was fundamentally pernicious.

The motion was defeated by a large majority.

City & South London Railway Co.—The *Financier* states that the holders of considerably more than 75 per cent. of the ordinary stock of the City and South London Railway Co. have accepted the offer of exchange recently made by the Underground Electric Railways Co., of London, Ltd., and that the offer has in consequence become binding.

A Norwegian Electrolytic Copper Co.—It is reported from Kristiania, that the Norwegian Electrolytical Copper Extraction Co., which has adopted the Hybinette process, has increased its capital from £25,000 to £41,700 minimum, and £55,500 maximum. The company has recently taken over the Bandak Electrolytical Works, and the increase of capital is in connection with this transaction. The purchase sum in question is £14,000, which is going to be paid in shares.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets as a whole remain depressed and unhappy. The approach of Christmas is heralded by more than the usual crop of troubles at home and abroad. Uncertainty seems to dog the footsteps of finance and politics alike. "Nothing is cheap nowadays," said an experienced member of the Stock Exchange. "In many cases prices are considerably undervalued, but in view of the abnormal condition of the times, you cannot call anything really cheap." This, of course, is looking at it from the speculator's point of view; but the investor, too, is troubled by the obscurity of the outlook.

One of the bargains to be found in the markets with which we deal, is Westminster 3½ per cent. Debenture stock. The price is nominally about 87½, at which the yield is 4 per cent., allowing for the accrued interest; but inasmuch as the stock is redeemable at par in March, 1920, the return on the money is raised to at least 2 per cent. more, and 6 per cent. on a security which is absolutely gilt-edged, must be regarded as a real bargain. Unfortunately, there is a scarcity of the stock, but if a buyer could get hold of it at the present price, he would be indeed foolish to allow his opportunity to slip.

Other prices in the English Electricity Supply department are scarcely so firm as they have been recently. Brompton Preference were marked down 5s., but soon rallied again, and Charing Cross Ordinary fell ¼. County of London Ordinary are somewhat easier at 11⅞. Edmundson's shares are now quoted in their new guise, as a reference to our price lists will show. Kensington Debenture has been in request, and at 93½ is 2 points up on the week.

The Railway market, after being depressed by the North-Eastern business, braced up upon the conclusion of the strike on that system. The decision arrived at by the Commissioner has been received with a good deal of dissatisfaction in the Stock Exchange, since it is feared that it opens an avenue to fresh trouble hereafter. However, prices rallied to some extent, but substantial falls remain so far as Undergrounds are concerned. Metropolitans and Districts are flat. Central London Ordinary and Deferred show falls of a point apiece, notwithstanding the publication of the company's circular to shareholders anent the amalgamation with the Underground Electric group. City and South Londons fell away—this, too, in spite of the fact that the shareholders by the necessary majority have decided to accept the offer made by the same group. Underground Electrics themselves are lower, the 1s. shares falling $\frac{3}{16}$ and the Ordinary losing 5s., though it is argued in well-informed quarters that the latter are amongst the cheap speculative lock-ups.

London United Tramways and Metropolitan Electric Tramways issues became a nominal market as the last day approached for sending in consents to the London and Suburban scheme. The quotations for London and Suburban issues themselves are 8s. 6d. for the Deferred, 14s. 9d. the Preferred and the Debenture stock about 87. British Electric Tractions are steady, the 5 per cent. Perpetual Debenture stock being 2½ better at 94. Business has been fairly animated in most of the Railway and Tramway descriptions, but, like everything else, prices suffered from the general uneasiness which prevailed throughout the Stock Exchange.

The Telegraph market has seen a good deal of excitement over Marconi shares. At one time the price of the Ordinary fell to 4$\frac{15}{16}$, holders getting out for the reason advanced here last week. This drop upset the prices of the subsidiary companies, Canadians, Americans, and Spanish indicating falls—severe in the case of the first-named. A slight rally followed as the price of the parent shares recovered, but still a fall of 10s. remains on balance. National Telephone Deferred, after being 146, fell to 136, hardening from that price to 137½, a drop of 18 points in a fortnight. Market anticipation does not look for an unofficial announcement as to the purchase price by the Government until the middle of next month; and, pending this, some of the holders have been getting fidgety. The intrusion into the situation of claims from holders of First and Second Preference shares is another cause for modification of optimism as regards the Deferred stock.

Amazon Telegraphs have been flat, falling 7s. 6d. Direct Spanish dropped ¼, and West India and Panama 1s. 8d. The market, as a whole, suffered from depression, though for the prior charge securities there has been a fair demand, and improvements are shown in Direct West India Debenture, Eastern Telegraph Debenture, and West India and Panama Debentures. Various issues were marked *ex* dividend last Thursday. Allowing for this, there is no particular net change in the quotations.

Foreign Traction stocks and shares are mostly weaker. Substantial falls have occurred in Brazil Traction, Mexico Tramways, Montreal Light and Power, River Plate Ordinary, and Shawinigan Water. For some of these there are special reasons, as, for example, in the case of the Brazil Traction shares, where selling has proceeded from German sources said to be in financial difficulty. Shawinigan Water was affected by the steep fall in Canadian Pacific shares, and the slump which has taken place in Americans cast its reflection upon Latin-Canadians as well. The news from Mexico is tolerably reassuring; but, with markets more political than financial, it failed to have any favourable influence, and the drop in Mexico Trams is 3 points. Kaministiquia Common lost 2 to 143½. La Plata Ordinary recovered a little to $\frac{15}{16}$ middle. United Electric Trams of Monte Video are easier, while the Anglo-Argentine group maintains its prices with marked strength.

In the manufacturing division, the principal change is a fall of 10s. in India-Rubber shares, which is not surprising in view of the big rise that took place previously. Edison & Swan came back ¼, and British Westinghouse Preference fell ¼. Castner-Kellners are a trifle easier at 3$\frac{11}{16}$. The rubber share market sagged off, in sympathy with a decline in the price of the raw produce at the sales this week. There is, however, a fair amount of quiet investment buying going on in the cases of the leading shares, and the floating supply of stock is steadily becoming restricted.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, December 18th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16 10	..
a Copper Sulphate	„	£25 10	10s. dec.
a Lead, Nitrate	„	£28	£1 dec.
a „ White Sugar	„	£25 10	..
a „ Peroxide	„	£32	..
c Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (88/90 %) ..	per ton	£22 10	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide (98/100 %) .. (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	72/6	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5	..
a Soda, Caustic (white 70/72 %) ..	„	£10 5	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks ..	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£95	£5 inc.
b „ Wire, in ton lots ..	„	£112	..
b „ Sheet, in ton lots ..	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	9d.	¼d. dec.
c „ Tube (brazed)	„	10½d.	¼d. dec.
c „ „ (solid drawn)	„	9¼d.	¼d. dec.
c „ Wire, basis	„	9d.	¼d. dec.
c Copper Tubes (brazed)	„	1/0½d.	¼d. dec.
c „ „ (solid drawn)	„	11½d.	¼d. dec.
g „ Bars (best selected) ..	per ton	£90	£3 dec.
g „ Sheet	„	£90	£3 dec.
g „ Rod	„	£90	£3 dec.
d „ (Electrolytic) Bars ..	„	£82	..
d „ „ Sheets ..	„	£99	..
d „ „ Rods	„	£87	..
d „ „ H.C. Wire	per lb.	10$\frac{15}{16}$d.	..
f Ebonite Rod	„	6/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/10	..
h Gutta-percha, fine	„	..	..
h India-rubber, Para fine	„	4/6	½d. dec.
j Iron Pig (Cleveland warrants) ..	per ton	66/9	4d. dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£18 10	..
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£7 8 6	4/- dec.
e Mica (in original cases) small ..	per lb.	6d. to 8s.	..
e „ „ „ medium	„	8/6 to 6/-	..
e „ „ „ large ..	„	7/6 to 11/-	..
p Phosphor Bronze, plain castings	„	1/2 to 1/4	..
p „ „ rolled bars & rods	„	1/3	..
p „ „ rolled strip & sheet	„	1/2½	..
o Platinum	per oz.	18/-	..
d Silicium Bronze Wire	per lb.	11½d.	..
Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£229 10 to £230 10	£1 inc
n „ Wire, Nos. 1 to 16 ..	per lb.	2/9	..
p White Anti-friction Metals ..	per ton	£45 to £230	..
k Zinc, Sh's (Vieille Montagne bnd.)	„	£31 12 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
j Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd
p
r W. F. Dennis & Co

Electromobile Co., Ltd.—The directors report that the accounts for the year to August 31st show that, after providing for debenture interest, writing off £4,683 in respect of the Charrington Street building scheme, and £5,862 for depreciation of carriages and plant, the debit balance of £19,978 brought down was increased to £30,145.—*Financier.*

Eastern Telegraph Co., Ltd.—The directors have declared a dividend at the rate of 3½ per cent. per annum, less income-tax, on the preference stock for the quarter ending December 31st, and the third quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax, for the year to December 31st.

Blackpool, St. Anne's and Lytham Tramways Co.—In the report for the year ended October 31st, the directors regret the unsatisfactory result on the year's working. Up to the end of May the traffic showed a gradual expansion, the increase to that date totalling about £1,000. Afterwards, owing to bad weather, there was a diminution of traffics in the summer months of £2,480. On the other side, there is an increase in the expenditure, arising on the upkeep of the permanent way. The trustees for the debenture-holders have, upon the recommendation of the directors, intimated their intention of paying 1½ per cent. on account of the arrears of interest due on the debenture stock, and to enable this payment to be made the annual payment of the sinking fund has been suspended for this year.

Electrical Securities Trust, Ltd.—The directors report for the year to November 14th, a loss of £1,436, increasing the total deficiency to £56,026.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Dec. 17th.	Rise + or Fall −	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord. ..	10	5½	5†	9⅛ — 10⅛	..	5 4 9
Do. 4½ % Pref.	10	4½	4½	8⅝ — 9⅜	..	4 12 4
Do. Second 6 % Pref. ..	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	98 —100	..	4 10 0
Brompton & Kensington, Ord...	5	10	9†	8⅞ — 9¼	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8½ — 9	..	3 17 9
Central Electric Supply, 4 % Guar. Deb.	100	4	4	95 — 98	..	4 1 8
Charing Cross, West End & City	5	5	5†	4⅝ — 5⅛	— ⅛	4 17 7
Do. 4½ % Cum. Pref. ..	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4 — 4½	..	5 0 0
Do. Do. 4 % Deb... ..	100	4	4	92 — 94 xd	..	4 5 1
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	98 —101	..	4 9 1
City of London, Ord.	10	8	6†	16 — 18	..	4 9 0
Do. 6 % Cum. Pref.	10	6	6	12 — 13½	..	4 9 0
Do. 5 % Deb.	Stock	5	5	118 —122	..	4 2 0
Do. 4½ % Second Deb. ..	100	4½	4½	100 —103	..	4 7 5
County of London, Ord... ..	10	6	4†	11¼ — 12	..	5 0 0
Do. 6 % Pref.	10	6	6	11⅝ — 12⅛	..	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	106 —108	..	4 3 4
Do. 4½ % Second Deb. ..	Stock	4½	4½	98 —101	..	4 8 8
Edmundson's, Ord.	£3	Nil	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	Nil	3	4 — 5	..	..
Do. 6% Non-Cum. Pref. ..	5	..	..	1 — 2	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	8†	7⅞ — 8	..	5 12 6
Kensington & Knightsbridge, Ord	5	9	8†	7⅝ — 8⅛	..	5 10 9
Do. 4 % Deb.	Stock	4	4	92 — 95	+2	4 4 3
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	3	2½	..	1½ — 2	..	3 15 0
Do. 6 % Pref.	5	6	6	4⅜ — 5½	..	5 14 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	88 — 91 xd	..	4 8 0
Metropolitan	5	4	4†	3⅜ — 3⅝	..	5 3 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	5 0 0
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	99 —102	..	4 8 3
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	99 —101	..	4 1
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98½—101½	..	4 18 6
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 11	..	5 9 1
Oxford	5	7½	6†	6⅛ — 6⅝	..	5 9 6
St. James' and Pall Mall, Ord.	5	10	10†	9½ — 10½	..	4 17 7
Do. 7 % Pref.	5	7	7	6⅞ — 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 88	..	3 19 7
Smithfield Markets, Ord. ..	5	2	..	1⅜ — 1⅞	..	..
South London, Ord.	4	5	..	2⅞ — 3⅛	..	5 18 4
Do. 5 % First Mort. Deb. ..	100	5	5	98 —101	..	4 19 0
South Metropolitan, 7 % Pref...	1	7	7	1⅝ — 1⅝	..	5 9 5
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 11 3
Urban, Ord...	£3	Nil	..	⅛ — ⅜	..	..
Do. 5 % Cum. Pref.	5	2	⅛	2⅜ — 2¾	..	..
Do. 4½ % First Mort. Deb...	100	4½	4½	84½— 86½	..	5 1 8
Westminster, Ord.	5	10	9†	8⅜ — 9⅛	..	5 8 1
Do. 4½ % Cum. Pref... ..	5	4½	4½	4⅞ — 5¼	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 6 8
Calcutta, Ord.	5	8½	7†	6⅜ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	94 — 96	..	5 4 2
Canadian Gen. El. Com. ..	$100	7	7	117 —121	—1	5 15 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	5	3/16 — 1/4 xd	..	5 6 8
Do. 5 % Deb.	100	5	5	95 — 98	..	5 2 0
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94 xd	..	6 7 8
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	86 — 89	..	5 12 4
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95½— 97½	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 5/16	..	Nil
Do. 6 % Pref.	1	6	6	15/16 — 1 1/16	..	8 14 6
Kaministiquia Power, 5 % G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	Nil	..	1½ — 2	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 8
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	86½— 88½	..	5 13 0
Mexican Lt. & Power, Common	$100	4	4†	89½— 86½	..	4 12 6
Do. 7 % Cum. Pref.	$100	7	7	103 —106	—1	6 12 1
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95 — 97	..	5 3 1
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	85½— 87½	..	5 14
Montreal, Lt., H. and Power ..	$100	8	9†	227 —232	—7	3 17 7
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	29 — 33	..	..
River Plate, Ord.	Stock	10	..	225 —235	—11	4 5 1
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	106 —111	..	5 5 8
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	98 —100	..	4 10 0
Shawinigan Water, Capital ..	$100	5	5	138 —143	—2½	3 10 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	106 —108	..	4 12 9
Do. 4½ % Per. Deb.	Stock	4½	4½	100 —102	..	4 8 3
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97½— 99½ xd	..	4 10 5
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	93½— 96½	..	5 3 8
Victoria Falls Power, Pref. ..	1	11 7/16d.	17 7/16d.	3/16 — 5/16	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103½—105½	..	5 13 9

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	7 — 7⅞	— ⅛	6 0 0
Do. 5 % Deb. Red.	Stock	5	5	97 — 99	..	5 1 0
American Telep. & Teleg., Cap.	$100	8	8†	142 —144	— ½	5 11 0
Do. Collat. Trust	$1000	4	4	93 — 95	..	4 4 3
Anglo-American Telegraph ..	Stock	8	8	67 — 69	..	4 7 0
Do. 6 % Pref.	Do.	6	6	110¾—111¼	..	5 7 8
Do. Def.	Do.	80/-	..	25/16 — 25/8	— 1/16	5 16 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7⅞ — 7¾	..	5 3 3
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	80½ — 82½	..	4 17 0
Cuba Telegraph	10	6	6†	8½ — 9¼	..	6 6 4
Do. 10 % Pref.	10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	5	4	4†	3¼ — 3⅜	— 1/16	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6½ — 7	..	7 2 10
Direct United States Cable ..	10	5	4	7 — 7½	..	6 13 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	+ ½	4 9 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	133 —136	..	5 3 0
Do. 8½ % Pref. Stock.. ..	Do.	8½	8½	77 — 79	..	4 8 7
Do. 4 % Mort. Deb.	Do.	4	4	96 — 98	+ ½	4 1 8
Eastern Extension	10	7	7†	13 — 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	96 — 98	..	4 1 8
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 — 101	..	3 19 3
Globe Telegraph and Trust ..	10	6	6†	10½— 11 xd	— ⅛	5 9 1
Do. 6 % Pref.	10	6	6	12⅝— 12¾ xd	— ⅛	4 13 2
Great Northern Telegraph ..	10	18	18	27½— 29½	— ½	6 2 0
Indo-European Telegraph ..	25	13	5†	56 — 58	..	5 12 1
Mackay Companies Common ..	$100	5	5	85 — 88 xd	..	5 13 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70 xd	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	4⅛ — 4⅜	— ⅛	4 11 6
Do. 7 % Cum. Partic. Pref.	1	17	..	3⅝ — 3¾	— ⅛	4 7 8
Monte Video Telephone, Ord...	1	6	6†	1/16 — 1 1/16	..	5 18 0
Do. 5 % Pref.	1	5	5	3/32 — 3/16	..	5 18 6
National Telephone Def. ..	Stock	6	..	136 — 139	—9	..
New York Telep., 4½% Gen. Bnds.	100	4½	4½	97⅜ — 98⅜	..	4 11 2
Oriental Telep. and Elec. ..	1	8	6†	1 3/16 — 1 5/16	..	4 9 10
Do. 6 % Cum. Pref.	1	6	6	1 3/32 — 1 3/16	..	4 18 6
Do. 4 % Red. Deb.	Stock	4	4	88½— 90½	+ ½	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	10	10	10†	10½— 11½	— ½	8 17 10
Submarine Cables Trust ..	Cert.	6	6	127 —130	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½—101½	..	4 8 8
United River Plate Telephone	5	8	..	7⅜ — 7⅝	..	5 5 10
Do. 5 % Cum. Pref.	5	5	5	5⅜ — 5⅝	..	4 8 11
West Coast of America	2½	2½	..	1⅜ — 1½	..	3 18 5
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	2½	1½†	3 — 3½	— ⅛	..
Do. 6 % Cum. 1st Pref. ..	10	6	6	10 — 10½	..	5 14 8
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9½ — 10	..	6 0 0
Do. 5 % Debs.	100	5	5	102 —104	+ ½	4 16 2
Western Telegraph, Ltd. ..	10	7	7†	13 — 13½	— ⅛	5 3 8
Do. 4 % Deb.	Stock	4	4	95½— 97½	..	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	97 —100	—1	4 10 0

* Unless otherwise stated, all shares are fully paid. *a* Paid in deferred interest warrants. † Interim Dividend. ‡ 8s. in Funded Dividend Certs

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Dec. 17th.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
Bath Trams, Pref. Ord.	1	Nil	Nil	⅜ — ½	..	Nil
Do. 5 % Pref.	1	5	5	1⅛ — 1¼	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	76 — 81	..	5 11 1
Brit. Elec. Trac., 6 % Pref. ..	100	..	..	11½ — 13½	..	..
Do. Do. Deferred ..	100	..	..	5 — 7	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	87 — 89 xd	..	6 13 4
Do. 7 % Non-Cum. Pr'f.	100	..	..	39 — 42	..	..
Do. 5 % Perp. Deb. ..	100	5	5	92 — 96	+2½	5 4 2
Do. 4½ % 2nd Deb. ..	100	4½	4½	77 — 81	..	5 7 2
Central London Railway, Ord.	100	8	8†	80 — 82	—1	8 13 2
Do. Pref.	100	4	4	81 — 88	..	4 16 5
Do. Def.	100	2	..	79 — 81	—1	2 8 9
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
City & South London, Ord. ..	100	1⅝	1½†	34½ — 35½	—1	3 15 4
Do. 5 % Pref., 1891	100	5	5	109 —111	..	4 10 1
Do. Do. 1896	100	5	5	109 —111	..	4 10 1
Do. Do. 1901	100	5	5	109 - 111	..	4 10 1
Do. Do. 1908	100	5	5	109 —111	..	4 10 1
Do. 4 % Deb.	100	4	4	98 —100	..	4 0 0
Dublin United Trams, 6 % Pref.	10	6	6	12 — 13	..	4 12 4
Great Northern & City, Pr't. Ord	10	Nil	Nil	2½ — 2⅝	..	Nil
Hastings Trams, 6 % Pref. ..	1	6	6†	15/16 — 31/32	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	69 — 74	..	6 1 7
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2¼ — 2⅝ xd	..	4 15 3
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb. ..	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	5 — 6	..	.
Do. 4 % Deb.	100	4	4	72 — 75	—1	5 6 8
Metropolitan Railway Consol. ..	100	1⅞	1½†	51⅜ — 52½	—2½	3 2 2
Do. Surplus Lands	100	2½	2½†	62 — 64	..	4 6 0
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord. ..	100	Nil	Nil	39⅜ — 40½	—1	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 8
Do. 4½ % First Pref.	100	4½	4½	88 — 90	..	5 0 0
Do. 3½ % Gtd.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan Elec. Trams, Ord.	1	6	5†	1 1/16 — 1 3/16	—1/16	5 1 1
Do. Def.	1	Nil	..	⅛ — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ½	—1/16	5 14 3
Do. 4½ % Deb.	100	4½	4½	93 — 95	..	4 14 9
Do. 5 % Deb.	100	5	5	94 — 97	..	5 3 1
Potteries, Ord.	1	3½	..	5/16 — 7/16	..	..
Do. 5 % Pref.	1	5	5	1/2 — 9/16	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	85 — 88	..	5 2 8
South Metro. Trams, 6 % Pref.	1	6	..	1 1/16 — 1 1/8	..	7 7 8
Do. 4 % Deb.	100	4	4	67 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	3⅜ — 4⅛	— ⅛	Nil
Do. "A"	1/-	..	..	1/16 — 1/8	..	..
Do. 6% First Cum. Inc. Deb.	100	..	6	112 —114	..	5 5 3
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 3
Do. 6 % Income	100	1½	£2	89½ — 90½	— ½	..
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	8	..	3 — 3½	..	4 5
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref. ..	5	5½	5½	4⅞ — 5⅛	..	4 17 9
Do. 2nd Pref.	5	5½	5½	4 1/16 — 4 1/8	..	5 17 4
Do. 4 % Deb.	100	4	4	93½ — 95½	+ ½	4 8 9
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	97½ — 99½	..	5 0 6
Auckland Trams, 5 % Deb. ..	100	5	5	103½ —105½	..	4 14 9
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brazilian Traction Light and Power	$100	..	..	90 — 92	—3½	..
Brisbane Trams Invt., Ord. ..	5	8	8†	7 1/16 — 7 5/16	..	5 9 5
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 15 8
Do. 4½ % Deb.	100	4½	4½	100½ —103½	..	4 7 0
B. Columbia Elec. Rly., Def. ..	100	8	..	139 —144 xd	..	5 11 2
Do. Pref. Ord.	100	6	6	116½ —120½	..	4 19 7
Do. 5 % Pref.	100	5	5	106½ —109½	..	4 11 4
Do. 4½ % 1st Mort. Deb. ..	40	4½	4½	98½ —101½	+ ½	4 8 8
Do. 4½ % Vancouver Deb. ..	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	97 —100	—3	4 5 0
Calcutta Trams, Ord.	5	7	5†	5⅝ — 6⅛	..	5 14 3
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8
Cape Electric Trams	1	2½	..	⅜ — ½	..	..
City Buenos Aires Trams (1904)	5	5	5†	5 1/16 — 5 1/8	..	4 8 0
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 97	..	5 2 1
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % A Deb.	100	5	5	86 — 91	..	5 10 0
Do. 6 % B Deb.	100	6	3	35 — 43	..	..
La Plata Elec. Trms, Ord. ..	1	Nil	..	31/32 — 1 1/32	+ 1/32	..
Do. Pref.	1	6	..	31/32 — 1	..	6 0 0
Lisbon Elec. Trams, Ord. ..	1	6	6†	1 — 1½	..	4 16 0
Do. 6 % Pref.	1	6	6	1 — 1½	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb. ..	100	5	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb. ..	100	5	5	89 — 92	..	5 8 8
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½—102½	..	4 17 7
Mexico Trams Com.	$100	7	7†	109 —111	—3	6 6 2
Do. Gen. Con. 5 % Bonds ..	..	5	5	95½ — 97½	..	5 2 7
Do. 6 % Bonds	100	6	6	101½—103½	..	5 16 0
Para Elec. Rlys. & Lt., Ord. ..	5	10	10†	7⅜ — 7⅝	— ⅛	6 11 2
Do. 6 % Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	+ ½	5 1 0
Perth (W.A.) Elec. Tr., Ord. ..	1	5	5½	1⅜ — 1½	..	3 14 5
Do. 5 % 1st. Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref. ..	5	6	6	5½ — 6	..	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	99 —101	..	4 9 1
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	102 —104	..	4 16 2
Do. 5 % Mort. Bonds ..	100	5	5	96½ — 98½	— ½	5 1
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	101½—103½	..	4 16 7
Singapore Trams, 5 % Deb. ..	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	—1	5 3 1
Un. Elec. Trams Monte Video ..	5	7	6†	5½ — 6	— ½	5 16 8
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	— ⅛	5 11 7
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	⅜ — ½	..	8 0 0
Do. 6 % Pref.	1	6	6	7 29/32 — 8 1/32	—1/32	7 13 11
Babcock & Wilcox	1	22	14†	8 — 9½	..	4 6 2
Do. Pref.	1	6	6	1 15/16 — 1 31/32	..	3 16 10
British Aluminium, Ord. ..	1	Nil	..	⅜ — ½	..	..
Do. 6 % Cum. Pref.	1	Nil	..	1 1/16 — 1 1/8	..	..
Do. 5 % Prior Lien Debs. ..	100	5	5	91 — 94	—1	5 6 5
Do. Deb. Stk.	100	5	5	86 — 89	..	5 12 4
B.I. & Helsby Cables	5	10	8†	7⅛ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	103 —105	..	4 5 9
British Thomson-Houston, Deb.	100	4½	4½	94 — 96	..	4 13 9
British Westinghouse, Pref. ..	3	Nil	Nil	⅜ — ½	— ⅛	Nil
Do. Deb.	100	4	4	58 — 61	..	6 11 2
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	3/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ½	..	Nil
Do. 5 % Prior Lien Deb. ..	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	47 — 52	..	8 13 2
Do. 4½ % Second Deb. ..	100	4½	4½	80 — 84	..	13 4 8
Callender's Cable	6	15	10†	10½ — 11½	..	6 13 4
Do. Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	99½—101½	..	4 8 8
Castner-Kellner	1	20	20	8⅜ — 8½	—1/16	5 6 8
Do. Deb.	100	4½	4½	106 —109	+1	4 2 7
Crompton & Co.	2	Nil	..	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	56 — 66	..	7 11 6
Dick, Kerr	1	5	Nil	1 1/16 — 1 1/8	..	..
Do. Pref.	1	6	6	⅞ — 15/16	..	6 17 2
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £8 paid ..	5	Nil	..	⅛ — ¼	..	Nil
Do. fully paid	5	Nil	..	1 — 1⅛	— ⅛	Nil
Do. 4 % Deb.	100	4	4	65 — 69	..	5 16 0
Do. 5 % Second Deb.	100	5	5	72 — 75	..	6 18 4
Electric Construction	2	2½	3⅜	1⅜ — 1 7/16	..	7 1 4
Do. Pref.	2	7	7	1⅞ — 2	..	7 0 0
Greenwood & Batley, Pref. ..	10	7	7	7⅞ — 8	..	8 6 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	..
Do. Deb.	100	4	4	90 — 95	..	4 4 8
Henley's, Ord.	5	17	5†	12½ — 13	..	6 10 9
Do. Pref.	5	4½	4½	4 1/16 — 5 1/16	..	4 9 0
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	..	7½	9⅜ — 10⅜	— ⅛	6 19 6
Do. Pref.	10	5	5	9⅜ — 10⅜	..	4 17 7
Telegraph Construction	12	17½	5†	84½ — 86½	..	5 18 0
Do. Deb.	100	4	4	97½—100½	+ ½	3 19 6
Willans & Robinson	1	Nil	..	1/16 — 3/16	..	Nil
Do. Pref.	5	Nil	..	⅛ — ¼	..	Nil
Do. Deb.	100	4	4	57 — 59	..	6 15 7

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 17th, 1912.

INDUSTRIES AND INDUSTRIAL CONDITIONS IN THE ARGENTINE.

BY ALFRED H. GIBBINGS, A.M.I.C.E., of Buenos Ayres.

(*Continued from page* 972.)

From what has already been said, it is apparent that the really important works are few in number. The following are the principal :—

Sugar Industry.—As stated, the centre of the sugar industry is at Tucuman, where there are 37 sugar factories, which also turn out a considerable quantity of rum. This industry is also being extended to other parts, notably in the territories of Misiones, Chaco and Formosa. The value of the sugar produce and its by-products amounts to over £5,000,000 per annum. The machinery for sugar crushing and refining is principally of British manufacture, certain well-known firms having made a speciality of the market. The crushed cane residues are used as fuel for raising steam in specially-constructed boilers, and wood is also used as fuel. From other points of view, the industry is not of any special engineering interest, except perhaps, now that the Hydro-Electric Co., of Tucuman, will shortly be supplying electricity in bulk, electric driving, lighting, and possibly electric processes may replace some of the existing methods.

The annual output of sugar is about 200,000 tons.

Wine Industry.—In the Argentina there are 3,409 wine presses, principally in the province of Mendoza, with 1,077 establishments, and also in San Juan, Salta, Rioja, Catamarca, Entre Rios, Cordoba, and Buenos Ayres. The raw materials used annually amount to over £4,000,000 in value, producing wine to the value of nearly £6,000,000. The most popular wines are red and white clarets, the better qualities of which are excellent. Nearly the whole output (about 50,000,000 gallons) goes to the City of Buenos Ayres, and even then the importation of foreign wines is about equal in quantity.

Electricity Works.—These are referred to again under the section on Industrial Conditions. On the 56 undertakings in the country, 18 are operated by the Compania Alemana Transatlantica de Electricidad, and of these 14 are sub-stations. The electricity works at Bahia Blanca is now under the control of the Buenos Ayres and Pacific Railway Co.; the Provincia de Buenos Ayres Electric Light and Power Co., Ltd., own the undertakings at Azul, Junin, and about half a dozen other small towns, in the province of Buenos Ayres. There is also a German Syndicate, which is obtaining control of several of the existing private companies.

The Rosario Electric Light and Power Co., originally a British concession and undertaking, has now passed into the hands of the Belgians with head offices in Brussels.

In Cordoba and Tucuman there are a few waterfalls, but the energy they furnish is comparatively small. There is one below the Barrage San Rogue, in the Sierra de Cordoba, belonging to the North American Light and Power Co., and having a capacity of about 3,000 H.P. It supplies electric energy for lighting and power to the city of Cordoba and also for the manufacture of carbide of calcium.

A company has recently been formed, called the Hydro-Electric Co., of Tucuman, to utilise the waterfalls in that neighbourhood and to supply electric energy in bulk to the city of Tucuman and district.

The National Government own a large number of small electric light and power works.

Cold Storage.—The following are the principal cold-storage concerns :—

The La Plata Cold Storage Co., Ltd., La Plata.
Cia. Frigorifico Armour de la Plata, Buenos Ayres.
The River Plate Fresh Meat Co., Ltd., Buenos Ayres.
Cia. Frigorifico Santiago, Ltda., Buenos Ayres.
Las Palmas Produce Co., Ltd., Buenos Ayres.
The Sansinena Frozen Meat Co., Ltd., Buenos Ayres.
Sociedad Anonima La Blanca, Buenos Ayres.
Sociedad Anonima La Negra, Buenos Ayres.
Cia. Frigorifico Argentino.

These companies jointly kill upwards of 8,000 head of cattle per day, principally for export as chilled meat. The Compania Frigorifico Armour de La Plata, a branch of the great Chicago house, has no separate works in operation, but is building an immense factory at La Plata. It has also some controlling interest in some of the other companies.

Breweries.—The principal breweries are :—

Cerveceria Argentina, Quilmes.
Cerveceria Bieckert, Buenos Ayres.
Cerveceria Palermo, Buenos Ayres.
Cerveceria Buenos Ayres, Buenos Ayres.
Cerveceria Rio Segundo.
Cerveceria San Martin.

Of these the Quilmes is the largest, turning out more than half the total beer consumption of the country. These breweries use a large amount of machinery, and there is room for other breweries, owing to the continual increase in the demand, and hence for machines for the preparation of malt, power plant and handling.

Ship Repairing, Engineering Works, Foundries, &c.—The only important engineering works in the Republic are situated in Buenos Ayres, the most prominent being *(a)* James Majoribanks, Boca, ship repairers and launch builders; *(b)* Pedro Vasena & Sons, engineers and iron and brass founders; *(c)* Talleres y Fundicion La Union, Ltda., foundry; *(d)* Zimmerman, Noe & Co., Barracas, agricultural implement makers.

These firms employ many thousands of hands, and the firm of Pedro Vasena & Sons are also large erectors of steel work for buildings.

Flour Mills.—Of the 330 flour mills scattered over the country, the majority are small concerns meeting the requirements of the immediate localities respectively. Much of the grain produced is exported without milling, and the heaviest demands for flour are in the City of Buenos Ayres, with its 1,500,000 population.

The largest establishment situated adjoining Dock 3, in Buenos Ayres, is the Molino del Rio de la Plata. It employs over 2,000 hands, and has machinery for milling and endless belt transmission of over 7,000 H.P., which consumes over 100 tons of coal per day. The power required for this one mill is equal to that of the remaining 329 flour mills together.

Other Industries.—With the exception of the general information given herein in the statistical tables there are no other works which call for special mention. At the same time interesting descriptions of many others could be given—notably the paper mills of Zarate, and the Alpagatas and cotton factories—but such descriptions would occupy much more space than is here at disposal. As no attempt has yet been made to bring this subject up to date, or to add in any way to the Government statistical information, the writer hopes to give it special attention during the coming year, with the object of issuing a publication of utility to commerce.

Industrial Conditions in the Argentine.—In an official publication of the Government, entitled "Boletin Nacional de Trabajo," issued annually, reports are made by Departmental Commissioners of the state and conditions of the several industries in the respective provinces and territories. The report for the city of Buenos Ayres is kept separate owing to the exceptional nature of its situation. One of the Departmental Commissioners referred to states that during normal periods the shop and factory hands are able to satisfy all demands, but as the years advance manufacturers are beset with serious difficulty in finding skilled artisans, even with an offer of 25 per cent. above the ordinary wage.

TABLE V.—SALARIES AND WAGES IN THE REPUBLIC.

The following is a list of salaries and wages paid in the Republic in 1909. Since that date, however, they have advanced considerably (20 to 25 per cent.) in the case of the more qualified skilled labour.

	Per day.					
	s.	d.		s.	d.	
Bricklayers.—						
Front finishers (piecework)	10	0	to	12	6	
Qualified workers	7	0	„	8	8	
Improvers	5	0	„	5	10	
Labourers	4	0	„	4	6	
Carriages.—						
Box makers	8	4	„	12	6	
Spring makers	—			8	4	
Anvil workers	10	0	„	12	6	
Filers	7	6	„	8	4	
Upholsterers	—			8	4	
Painters	9	2	„	10	0	

	Per day.
Carts.—	s. d. s. d.
Blacksmiths	7 6 to 8 4
Carpenters	6 8 „ 8 4
Rim fitters	8 4 „ 13 4
Carpenters.—	
Qualified workers	7 6 „ 8 4
Improvers	5 0 „ 6 0
Labourers...	per month £7 to £7 8s. 4d.
Ebonits (Cabinet Makers).—	
Qualified workers	8 4 „ 10 0
Improvers	5 0 „ 7 0
Polishers	7 6 „ 8 4
Apprentices	1 8 „ 3 4
Electricians.—	
Qualified workers	7 0 „ 8 4
Improvers	5 0 „ 6 0
Apprentices	1 8 „ 3 4
Tinkers.—	
Qualified workers	6 8 „ 8 4
Improvers	5 0 „ 6 0
Apprentices	1 8 „ 2 6
Blacksmiths.—	
First-class qualified workers	— 9 2
Second-class qualified workers	7 6 „ 8 0
Improvers	5 0 „ 6 0
Labourers	— 5 0
Stonemasonry.—	
First-class qualified workers (placers) ...	8 4 „ 10 0
Second-class qualified workers	6 8 „ 8 4
Improvers	5 0 „ 6 0
First-class polishers	— 8 4
Second-class polishers	— 6 8
Third-class polishers	5 0 „ 6 0
Painters.—	
Plain painters	7 6 „ 8 9
Letter painters	8 4 „ 9 2
Improvers	— 6 8
Apprentices	2 6 „ 3 4
Bronze and Brass (Mechanical and Metallurgical Shops).—	
Founders	6 8 „ 7 6
Improvers	4 2 „ 5 0
Apprentices	— 1 8
Mounters	6 8 „ 8 4
Filers	5 0 „ 6 8
Turners	7 6 „ 8 4
Enamellers	7 6 „ 10 0
Grinders and polishers	7 6 „ 8 4

	Per day.	Per month.
Dock Labourers.—	s. d. s. d.	
Stevedores	6 8	
Stevedores for night work	13 4	
Coalers	6 8	
Elevator hands	5 0 to 6 8	
Cranemen (private)		£8 6 8 to £10
Depôt labourers	6 8	
„ „		£7 10 0

The foregoing rates are those published in the Government returns for 1909—the latest available—but since then there has been an increase of 20 to 25 per cent.

This is not due in any sense to the influence of Trade Unions, but arises solely from the increased demand for locally manufactured goods—such as carts, carriages, motor-cars, boots and shoes, furniture, clothing, &c.—and the small percentage of the immigrants who are craftsmen. The Trade Unions, except as regards railway employés, are not in a strong position; and, in fact, they have a very poor sort of material to work upon, including many nationalities.

With regard to the nationality of these workmen, exclusive of the native Argentino, the immigration statistics for 1910 are as given in Table VI.

Of the foregoing, 189,866 were men, 58,414 were women, and the remainder children under the age of 13 years. Of the men, 78,016 were agricultural labourers, 4,398 masons, bricklayers and plasterers, 3,001 carpenters, 9,406 clerks and business men, 391 electricians, 140 stokers, 231 engine drivers, 1,626 mechanics, 525 miners, 479 painters, 75,967 day labourers and journeymen, and 2,135 shoemakers. Of the women, 16,432 were domestic servants. Up to the end of September last, the figures for 1911, so far as they are available, show an increase over those for 1910.

The number of factory workers—skilled and unskilled—in the whole of the Republic is under 40,000. It might be held that the high rate of salaries and wages is an object lesson of the value of import duties to the workman. But, as a matter of fact, it does not benefit the workman at all, as rent and food cost more than twice as much as in England; sanitary conditions are sadly neglected; clothes, domestic articles, and furniture are more than double in price, while recreations and every form of luxury are at prohibitive prices.

TABLE VI.—Immigration for Year 1910.

Nationality of the Immigrants.

Italians	102,019	Dutch	281
Spaniards	131,466	Fins	27
Russians	12,765	Montenegrins	151
Turks	15,478	Swedish	96
French	4,380	Peruvians	43
Austrians	4,542	Japanese	72
Hungarians	694	Paraguayans	13
Germans	3,282	Servians	226
English	1,825	Cubans	58
Argentinos	1,381	Bolivians	43
Roumanians	310	Bulgarians...	880
Swiss	710	Norwegians	64
Danes	553	Africans	48
Belgians	349	Venezuelans	27
Portuguese	2,848	Mexicans	17
North Americans ...	467	Chinese	13
Brazilians	795	Boers	5
Greeks	3,289	Indians	31
Moroccans	128	Colombians	9
Uruguayans	106	Egyptians	25
Chileans	103	Persians	21
Total		289,640	

Workmen's Insurance.—During the past four or five years insurance against accidents to workmen, both as regards personal insurance and insurance by the masters, has become almost as general as in England. The percentage of accidents in industrial establishments is slightly higher than in England. The percentage of accidents in the building trades is abnormally high, arising principally from the indifferent manner in which the scaffolding is fixed. The cause of this, again, is partly due to the very narrow pavements and streets which do not admit of the scaffold poles being erected from the ground. They are brought out from the building at a height of about 12 ft. from the street level.

The regulations and customs existing between the insurance companies and the insured firms are practically on similar lines as those in England. The floating policy is in vogue, usually on a six months' liquidation. The insurance companies, of course, reserve the right of inspecting the insured firm's pay-sheets at any time. Most of the well-known insurance companies are represented out here, and the competition amongst them is fairly keen.

The usual premiums paid are:—

All workmen employed on building erections, 23 per cent. of wages paid.

Mechanics and others employed in machine-driven shops, 14 per cent. of wages paid.

Other classes in proportion.

(*To be concluded.*)

THE COMMERCIAL DEVELOPMENT OF ELECTRICITY SUPPLY.

IV.—The Relation of Supply Authorities and Contractors.

The present unsatisfactory position in the relations of these two important sections of the electrical world cannot be denied, and it is the more deplorable seeing that a sound working understanding would exert a powerful influence on the welfare of electricity supply. A further regrettable fact is that unless the cause of unpleasantness is soon removed, the breach will tend to widen instead of close. With interests so closely allied it seems absurd that wise counsel on both sides has not found a way out of the threatened impasse. Constantly at cross purposes, the two parties would appear to regard one another with a feeling somewhat resembling the natural antipathy which exists between cat and dog.

Those who have laboured in both camps will no doubt find some difficulty in locating any sound cause for friction. That irritation does exist is undeniable, and it may probably be accounted for by the failure hitherto to find some common basis for amicable working. At the present

time, when the need for re-organisation of the forces of the electricity supply industry is most unmistakably apparent, the possibility of effectively enlisting the activities of the contracting fraternity in the cause of progress must be fully considered. Further mutual friendly overtures might result in clearing up grievances, real or imaginary, and a frank understanding might be arrived at enabling a co-operative policy to be adopted. An unbiased consideration of apparent existing conditions may be of assistance in improving the position.

From the supply engineer's standpoint the contractor is regarded as lacking in business energy. He is constantly suspected of inferior work, and although a sigh of thankfulness is breathed when an installation passes the insulation resistance test, it is tinged with regret that there is nothing to grumble at. A certain amount of disappointment is felt if no low-grade wire, shoddy accessories, or bad workmanship are found. The adoption of this attitude on the part of the mains engineer is largely due to the existence of the jerry wireman or black sheep of the contracting community, the man who undertakes work at a price inconsistent with soundness and a reasonable living profit. Such work is sometimes accomplished by the utilisation of inferior wire bought up in job lots of broken coils, and cheap and nasty accessories mounted on poor quality porcelain, the erection of which is carried out by incompetent boy labour. Injustice may also be done to contractors of high standing by subsequent additions in a very indifferent manner to first-class installations. The supply authorities may have no knowledge of such additions, and should their attention be drawn to serious faults which develop in consequence, it is possible that the whole of the work may be condemned, and the reputation of the original contractors unjustifiably damaged. With regard to the accusation of lack of business ability, the position of the electrical contractor renders him to a great extent dependent upon the commercial policy of the supply industry, which is at present indeterminate. The contractor justifiably feels a distinct lack of security in his sphere of activity, and it is unreasonable to expect him to jeopardise further capital in extending his business operations on an unstable foundation. Under the existing chaotic conditions there is no satisfactory assurance that progressive efforts would receive an adequate return.

Reviewing the contracting community, it will be found that there is great diversity with regard to the status of individual members. Included in its ranks are expert electrical engineers of long standing, many of whom are regarded as authorities on installation matters, and the humbler members are reinforced by the foreman and intelligent journeyman wireman commencing business on their own accounts. Many large furnishing and decorating firms have electrical departments, and the field has also been entered by a proportion of the plumbing and gas-fitting fraternity, who have hoped to retrieve business which vanished with the decline of the private gas-fitting industry.

Although the interests of electricity supply authorities and contractors are to a great extent parallel, the fact must not be overlooked that many of the latter are as busily engaged in installing generating plant as in carrying out installations to be supplied with current from public mains. In fact, the electrical equipment of country houses and other self-contained installations forms the bulk of many electrical contractors' businesses. In the case of the Metropolis, another point to be considered is that in comparison with the gas companies the territories of individual electricity supply authorities are almost parochial, and contractors cannot afford to restrict their activities to the district in which their business premises happen to be situated. Many contractors may, therefore, be doing excellent work in the interests of electricity supply generally, although perhaps not in sufficient quantity in any one particular district to attract the attention of individual supply engineers.

It may not be unreasonable to assume that as electricity supply authorities have displayed so little energy with regard to business development, whatever increase has been obtained has been largely due to the existence of contractors, who in their own interests have induced additional installations. It is no exception to find that reputable contractors have the implicit confidence of their clients, and their recommendations and advice are generally acted upon. This inclination to turn to the contractor rather than the supply authority has probably arisen on account of the lack of interest displayed by the latter in the welfare of the consumer, except on quarter days.

Among those officials of the electricity supply industry who are giving serious attention to the subject are a section of extremists, who are propounding the firebrand gospel of the total extermination of the contractor. They profess to see exactly similar circumstances in electricity supply to those existing when the elimination of the private gas fitter by the gas companies was commenced. In all probability the positions are not so analogous as the casual observer might be led to believe. It may be recalled that at the time when gas companies were seriously menaced by the competition of electricity, the incandescent gas mantle was also introduced. In accepting the inevitable, the gas industry adopted a thoroughly broad and liberal-minded policy. It was realised that the sale of gas for lighting purposes would be greatly reduced, and all efforts were directed to developing business in heating and cooking. Attention was also turned to the value of by-products, with such good effect that they will probably in the near future rank equally in importance with gas itself. At any rate, it is certain that to supply the present demand in the residual market, gas must necessarily be manufactured and sold. Gas companies, therefore, saw that abnormal efforts had to be made to put before the general public effectively the special claims for the utility of gas for purposes other than lighting, and, furthermore, that careful attention must of necessity be given to the maintenance of existing installations. Apparently the private gas fitting industry was not regarded as being in a position to meet the pressing requirements, and gradually sank into obscurity as a negligible quantity in gas progress.

In order to secure further development under the broader policy, it is imperative that action in the matter be taken by supply authorities, and the policies that may be adopted may be defined mainly on the following lines :—

1. Extermination of the independent contractor as at present existing.
2. Establishment of installation departments by supply authorities, and sub-letting of labour to contractors.
3. Combining the forces of supply authorities, contractors and manufacturers by amicable co-operation.

Those who adopt the whole-hogging attitude of extermination must bear in mind that in the process advocated the closing of contractors' establishments will really entail the loss of centres of activity, exerting in a greater or less degree a beneficial influence on the expansion of electricity supply, and, unless similar branches are established by supply authorities, will tend to greater centralisation and lessened elasticity of the commercial system. Assuming that the elimination of the contractor is gradual, there is certain to be solid opposition to the scheme, even where powers already exist, and measures to obtain legislative sanction in the future will prove costly.

With the necessary powers the question of the suitable organisation of the new department must then be considered, and in the case of supply companies, there is no doubt that in course of time the various details would straighten out, and work would proceed satisfactorily, but in the case of municipal authorities the result is not quite so certain. The few examples of the past working of such departments where constructive work has been carried out by direct labour are instructive, if not praiseworthy. Expert supervision is essential, and cannot be undertaken by "volt-ticklers," fresh from the station, or "ohm grinders," from the mains department. Efficient labour must be employed, and although odd jobs may be carried out on installations in the buildings of the supply department by cable jointers, such men are not necessarily practical wiremen. The conditions of employment in a municipal department of this description would not be conducive to efficient labour. Workmen would not feel that necessity to expend their energy at the same rate as in private employ, and this aspect would be reflected in a *bonâ fide* system of accounts.

The sub-letting of labour to contractors would also prove expensive, as this would in such a case necessarily be expected to bear its full measure of profit. Under present conditions, contractors are content to shorten somewhat the return on labour in consideration of profits resulting from the sale of material, fittings and apparatus. The establish-

ment changes in connection with the department would not in all probability be less on account of the sub-contracting of labour, and the overall result of either of the above experiments would possibly be higher cost of installations, which would be distinctly contrary to the aims and expectations of the promoters.

Having seen that the circumstances under which the gas manufacturers embarked upon the policy of extermination of the private gasfitter are not exactly similar to those with which the electrical industry is confronted, we may now consider the proposals for co-operation. Electricity supply is not menaced by a new competitor, but by the thoroughly earnest efforts of a rejuvenated and reorganised industry, and in order to embrace the attractive opportunities for development which are now presented, it is necessary to discard effete methods, and in formulating a new policy to give full consideration to the utilisation of existing forces in the cause of progress.

If assured that the intentions of supply authorities were in no way antagonistic to the interests of contractors, it is quite possible that the latter body would welcome friendly overtures, and render valuable assistance in the formulation of a programme of co-operative effort. They probably realise in common with other reasonable people that a house divided against itself is a very unstable structure, and that measures undertaken for its permanent security are worthy of support.

As contractors would share in the prosperity which would result from properly organised co-operative endeavours, there is no reason why they should not be regarded as important factors in the success of the industry. Up to the present reputable contractors have been in many quarters regarded in the light of canvassers in the interests of electricity supply, and the advantage might be extended by making their establishments really useful branches for publicity activity. Satisfactory arrangements might be made whereby the expense of literature and other items might be suitably apportioned, and with the feeling that their interests were vitally associated with those of the supply authorities, the zealous support of the contracting fraternity might be brought to bear on the fortunes of the industry.

The importance of the manufacturing community working in accord with both supply authorities and contractors has also a distinct bearing on the question of expansion. At present, owing to lack of co-ordination and organisation of these powerful factors for the common welfare, full benefit is not being obtained by the supply authorities from the activities of manufacturers. No really decisive line with regard to apparatus can be drawn, as exact requirements are not clearly understood, and makers are working independently, and more or less in the dark. Joint conference would, however, eliminate many difficulties in this respect, and as it is important that existing prices of apparatus be materially reduced in order to assist in the popularising of electricity for all purposes, the case for co-operative publicity efforts is forcibly and prominently established. In reviewing the foregoing leading points, it is to be hoped that the various aspects of the case will be thoroughly deliberated upon before vital steps are definitely taken, and that able and experienced counsels will be brought to bear on the subject with success, and a really forward policy inaugurated.

WIND MOTOR DEVELOPMENTS.

THE wind motor and the possibility of using it for electricity supply purposes on a small scale have attracted considerable attention in all parts of the world. Competition, however, in the shape of oil and spirit engines, and the necessity of providing for the very uncertain behaviour of the wind itself, have rather tempered enthusiasm for the wind motor as a possible prime mover.

Still, a good many examples of this class of apparatus have been brought into use, and an interesting description appeared in the *Mining and Engineering Review* of a new plant of this class, designed by Mr. W. A. P. Turnbull, electrical assistant to the N.S.W. Government Railways and Tramways, specially for dynamo driving, which was exhibited at the Sydney Agricultural Show early in the year.

The novel feature of the mill is the method of speed regulation, which has been patented.

This is shown diagrammatically only in fig. 1, in which (*a*) is a plan, and (*b*) an elevation of the apparatus. The wind wheel X runs on shaft D, which is rigidly connected to casting Z, which is

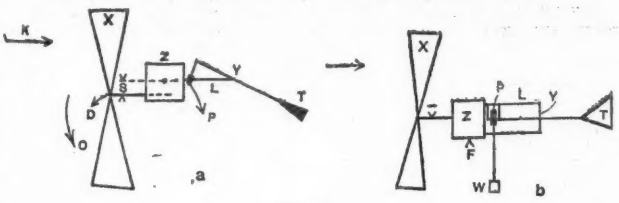


FIG. 1.

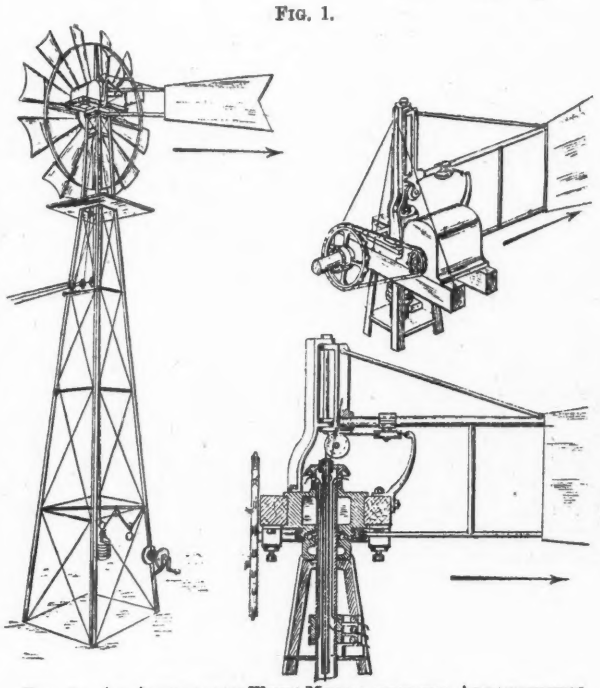


FIG. 2.—AN AUSTRALIAN WIND MOTOR, SHOWING ARRANGEMENT OF DYNAMO, SLIP-RINGS, &C.

pivoted at F on the supporting tower. The centre line of shaft D is to one side of the centre line of the pivot and tail apparatus. The tail of the mill T is free to turn horizontally on a fulcrum Y

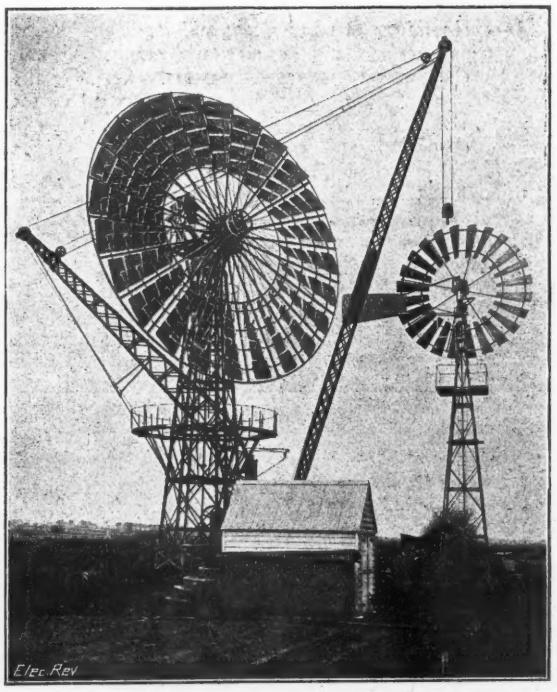


FIG. 3.—A 40' DIA. BRITISH WIND-MOTOR, WITH MOVABLE VANES.

rigidly supported from the casting Z, through frame L; the other end of the tail arm is, however, restrained in its movement by a

weight W, to which it is attached by a rope running over a pulley P carried on the framework.

The regulation is automatic. When the wind is blowing in the direction shown by the arrow K, the wind-wheel tends to turn out of the wind in the direction shown by the arrow O. The wind, however, tends to keep the tail T in the direction of the wind. If

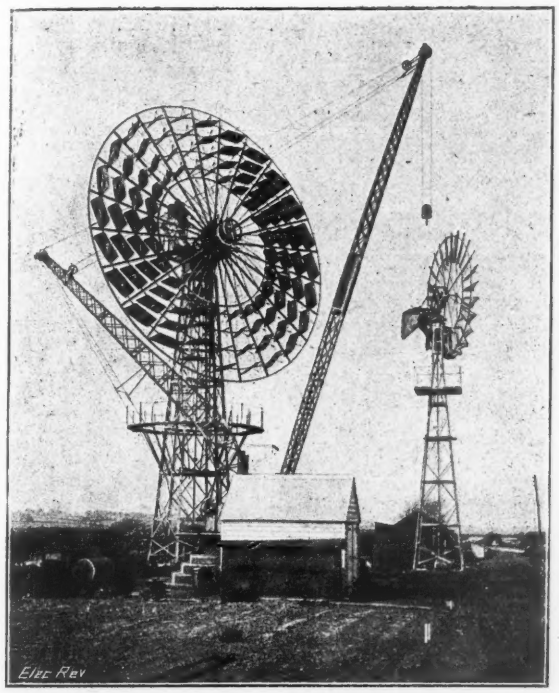


FIG. 4.—40-FT. WIND MOTOR WITH VANES OUT OF THE WIND.

W were made extremely heavy the tail would act as though rigidly connected to Z, and the regulation would be unstable. The weight, however, is so adjusted that the resultant of the two parallel forces acting at each end of the tail at right angles thereto, and which takes effect on Z through the pivot Y, balances the turning movement of the main wheel about the vertical axis of F, in such a manner that the wind-wheel turns out of the wind or into the wind according to whether the wind velocity rises or falls; the wheel then revolves at practically constant speed, over and above a maximum wind velocity—generally fixed at from 10 to 15 miles per hour. No matter what hurricane is blowing, the speed of the wind-wheel does not exceed this maximum, turning right out of the wind momentarily when the gusts are very severe, but maintaining the constant speed. In actual practice, in the larger sizes of wind-wheel, the inertia of the apparatus to a slight extent was found to affect the theoretical regulation, and for that reason Mr. Turnbull devised a simple and inexpensive electrical means of overcoming this. The most convincing proof of the regularity of the speed lies in the reading of the voltmeter connected across the generator terminals; this reading was found with very variable winds to be quite steady.

The action of the equipment, as a whole, is then as follows:—The main shaft of the wind wheel is connected directly (or through suitable gearing) to the generator, mounted in a water-tight case, on top of the tower, as shown in fig. 2.

The current is collected from slip-rings mounted inside the main casting, by brushes, and carried thence by suitable connectors to the battery and switchgear, which may be situated at will, in the base of the tower or within the premises, taking up very little room with the few cells employed. A simple, effective cut-in, cut-out (also specially designed by Mr. Turnbull), is provided on the switchboard, so as to connect or disconnect the generator and battery at the voltage of supply, say 12 to 50 volts, as required. The battery is always connected to the house wiring, unless specially switched off.

With limited wind velocities the battery will supply the required current until the generator takes up its load, and, if necessary, charges the battery. From observations by Mr. Turnbull and others, extending over lengthy periods, and from statistics furnished from the office of the N.S.W. Government Meteorologist, batteries can be provided with each equipment of sufficient capacity to tide over even abnormal periods of windless weather. It is not claimed that the apparatus will work satisfactorily in all localities.

According to our contemporary, a strong syndicate is in charge of the business arrangements connected with the invention, which is designed to suit Australian conditions.

Several firms in this country have specialised more or less successfully in the modern windmill, and, of course, examples of their work are to be found in most of our Colonies. We illustrate herewith a 40-ft. diameter mill constructed for pumping purposes for an Indian railway by Messrs. Robt. Warner & Co., and designed to move in a light wind of about 10 miles an hour, but provided with movable vanes on account of the large area exposed to heavy winds.

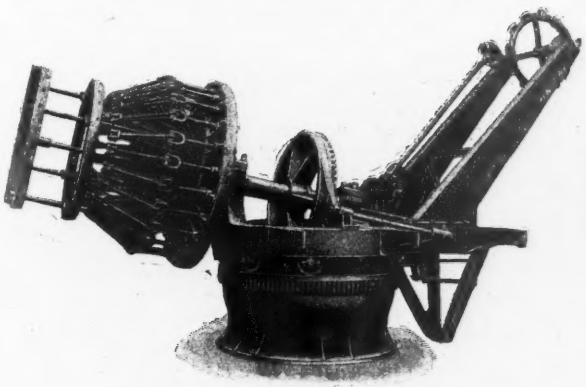
Our illustrations show the mill with the vanes both in and out of the wind, and the mill cap with the link motion for operating the vanes. The views also show the erecting cranes and a smaller mill of normal type with fixed vanes in the rear.

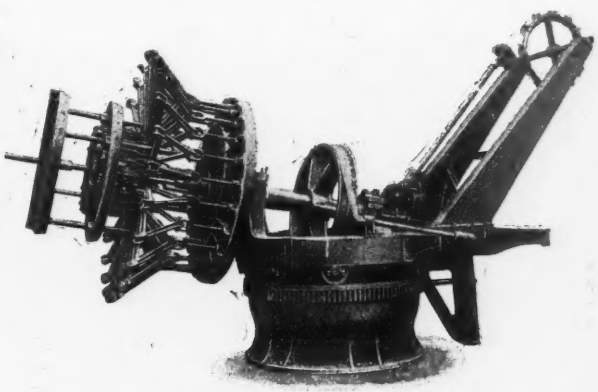
TRADE STATISTICS OF THE STRAITS SETTLEMENTS, 1911.

THE following statement, showing the imports of electrical and other materials into the various Straits Settlement ports in 1911, is taken from the recently issued trade statistics. The figures for 1910 are given for purposes of comparison, and notes of any increases or decreases have been added:—

IMPORTS INTO SINGAPORE.

	1910. Dollars.	1911. Dollars.	*Inc. or dec* Dollars.
Electrical goods (not otherwise shown).—			
From United Kingdom ...	114,000	Not	—
,, British India ...	16,000	shown	—
,, Belgium	1,000	as	—
,, Germany	6,000	such	—
,, Italy	5,000		—
,, Other countries ...	5,000		—
Total ...	147,000		





FIGS. 5 AND 6.—VIEWS OF MILL CAP, 40-FT. WIND MOTOR, SHOWING LINK MOTION FOR OPERATING THE VANES.

Gas and electric lighting materials.—			
From Germany	9,000	Not	—
,, United Kingdom ...	64,000	shown	—
,, United States ...	1,000	as such	—
Total ...	74,000		
Telegraph and telephone materials.—			
From Belgium	10,000	39,000	+ 29,000
,, Germany	1,000	28,000	+ 27,000
,, United Kingdom ...	162,000	123,000	— 39,000
,, Other countries ...	5,000	9,000	+ 4,000
Total ...	178,000	199,000	+ 21,000

	1910. Dollars.	1911. Dollars.	Inc. or dec. Dollars.
Tramway and railway materials.—			
From Belgium	21,000	21,000	—
„ Germany	—	1,000	+ 1,000
„ United Kingdom ...	254,000	102,000	— 152,000
„ Australia	51,000	—	— 51,000
„ Other countries ...	2,000	2,000	—
Total ...	328,000	126,000	— 192,000
Machinery.—			
From Belgium	1,000	Separately	—
„ Denmark	1,000	classified	—
„ France	21,000	in	—
„ Germany	93,000	1911	—
„ Holland	6,000		—
„ United Kingdom ...	1,242,000		—
„ United States ...	97,000		—
„ Other countries ...	145,000		—
Total ...	1,606,000		
Electrical machinery.—			
From United Kingdom ...	Not	181,000	—
„ Germany	shown	14,000	—
„ Italy	separately	11,000	—
„ Belgium		6,000	—
„ United States ...		4,000	—
„ Other countries ...		20,000	—
Total ...		236,000	
Engines, boilers and parts.—			
From United Kingdom ...	Not	330,000	—
„ Germany	shown	11,000	—
„ Netherlands ...	separately	20,000	—
„ United States ...		12,000	—
„ Other countries ...		45,000	—
Total ...		418,000	
Machinery, other (except sewing machines).—			
From United Kingdom ...	Not	686,000	—
„ Australia	shown	18,000	—
„ Germany	separately	26,000	—
„ United States ...		83,000	—
„ Other countries ...		66,000	—
Total ...		879,000	
Lamps and lampware.—			
From Belgium	10,000	6,000	— 4,000
„ Germany	264,000	238,000	— 26,000
„ United Kingdom ...	103,000	148,000	+ 45,000
„ United States ...	12,000	12,000	—
„ Other countries ...	34,000	32,000	— 2,000
Total ...	423,000	436,000	+ 13,000

IMPORTS INTO PENANG.

Electrical goods (not otherwise shown).—			
From United Kingdom ...	21,000	Not	—
„ Germany	30,000	shown	—
„ Other countries ...	2,000	as such	—
Total ...	53,000		
Machinery.—			
From Belgium	18,000	Separately	—
„ Germany	22,000	classified	—
„ United Kingdom ...	322,000	in	—
„ United States ...	14,000	1911	—
„ Other countries ...	35,000		—
Total ...	411,000		
Electrical machinery.—			
From United Kingdom ...	Not	56,000	—
„ Germany	shown	39,000	—
„ Other countries ...	separately	7,000	—
Total ...		102,000	
Engines, boilers and parts.—			
From United Kingdom ...	Not	429,000	—
„ Germany	shown	38,000	—
„ Belgium	separately	8,000	—
„ United States ...		22,000	—
„ Other countries ...		21,000	—
Total ...		518,000	
Machinery, other (excepting sewing machines).—			
From United Kingdom ...	Not	54,000	—
„ Belgium	shown	4,000	—
„ Germany	separately	3,000	—
„ Other countries ...		10,000	—
Total ...		71,000	

	1910. Dollars.	1911. Dollars.	Inc. or dec. Dollars.
Lamps and lampware.—			
From Austria	2,000	—	— 2,000
„ Belgium	1,000	3,000	+ 2,000
„ Germany	43,000	47,000	+ 4,000
„ United Kingdom ...	48,000	61,000	+ 13,000
„ Other countries ...	6,000	7,000	+ 1,000
Total ...	100,000	118,000	+ 18,000
Telegraph and telephone materials.—			
From United Kingdom ...	4,000	23,000	+ 19,000
„ Other countries ...	—	3,000	+ 3,000
Total ...	4,000	26,000	+ 22,000
Tramway and railway materials.—			
From United Kingdom ...	—	6,000	—

IMPORTS INTO MALACCA.

Telegraph and telephone materials.—			
From United Kingdom ...	1,000	2,000	+ 1,000
„ Other countries ...	1,000	—	— 1,000
Total ...	2,000	2,000	—
Machinery.—			
From United Kingdom ...	5,000	Separately	—
„ Other countries ...	11,000	classified	—
Total ...	16,000		
Electrical machinery.—			
From United Kingdom ...	Not shown	1,000	—
Engines, boilers and parts.—			
From United Kingdom ...	Not shown	1,000	—
Machinery, other (except sewing machines).—			
From United Kingdom ...	Separately	34,000	—
„ Other countries ...	classified	20,000	—
Total ...		54,000	
Lamps and lampware.—			
From United Kingdom ...	—	2,000	+ 2,000

IMPORTS INTO LABUAN.

Machinery.—			
From United Kingdom ...	72,000	—	— 72,000
Telegraph and telephone materials.—			
From United Kingdom ...	—	7,000	+ 7,000

N.B.—Dollar = 2s. 4d.

THE OTHO ELECTRIC ENGINE STARTING, IGNITION AND LIGHTING DYNAMO FOR MOTOR-CARS.

In view of the interest which is just now being taken in arrangements for enabling the engines of motor-cars to be started from the driver's seat, and so avoid the old familiar, yet troublesome handle grinding, it is not surprising that new devices are continually making their appearance. At present the movement in favour of abolishing the starting handle has made most progress in the United States, where quite a number of devices, wrongly named "self-starters," have recently made their appearance. Among the latest to come under our notice is the electrical system introduced by the Otho Motor Co., Boston, U.S.A., and as the arrangement is such that it acts not only as an engine starter, but provides the current for the ignition, and the lighting of the lamps, and also for the operation of the horn, the following description may be of interest.

Though the mechanism is similar to others of the same nature in that it generates its own current, stores it in an accumulator and then uses it to start the engine and light the lamps, the Otho arrangement is radically different from anything else of its kind in construction and the disposition of its few parts. Briefly, there is but a single moving part, and that forms the fly-wheel of the engine. There are no moving wires, no rotating field or armature coils, and there is nothing to require lubrication, the bearing which supports the fly-wheel being lubricated automatically from the crank case of the engine.

Technically, the system is of the type in which the principal unit is a combined electric generator and motor, the generator capacity being 40 amperes at 6 volts. A feature of the arrangement is that all the wiring, both that for the field and the armature, remains fixed, only the pole pieces and the brushes rotating. The engine fly-wheel itself forms the pole pieces, which are eight

in number, and also carries the brushes, the arrangement being indicated in figs. 1 and 2, which show two views of the movable portion. All the wiring is fixed on a "plunger," or central member, which is bolted to the engine crank case, and remains stationary between the rotating pole pieces formed in the fly-wheel. In addition, this central member carries the commutator, which is also shown in one of the accompanying pictures. By reason of the fact that there is no moving wiring, the possibility of damage to this portion of the system is claimed to be extremely remote.

In operation the system is as simple as it is in construction. A single switch serves to divert current from the storage battery to

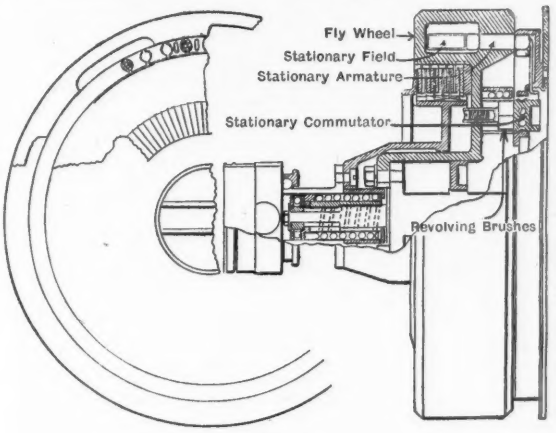


Fig. 1.

the motor-generator, the excitation of the field coils causing the fly-wheel pole pieces to rotate, and thereby start the engine. As a motor, the device is stated to be powerful enough, and the capacity of the battery sufficient to permit of the crankshaft of the engine being rotated at 75 R.P.M. for a period of 20 minutes if necessary. Such long applications of current are, however, rarely necessary, three or four revolutions of the crankshaft being sufficient to cause the engine to take up its own cycle of operations. Nevertheless, because of the speed at which the crankshaft is rotated, it is quite possible to start the engine on the magneto, though it is considered that a magneto will be an unnecessary adjunct, as current from the storage battery may be used for ignition purposes.

Immediately the engine commences to fire the motor automatically becomes a generator, though it is not connected to the storage battery until the car speed reaches approximately 10 miles an hour, when an automatic centrifugal switch comes into action. Current control depends not upon the strength of the current, but

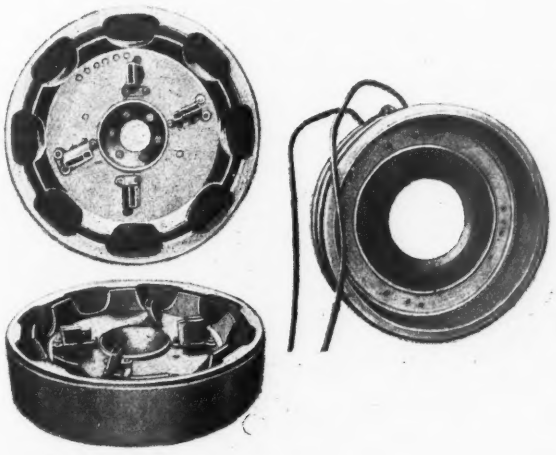


Fig. 2.

upon the speed of the engine, there being no magnetic switches in the make-up of the system. The centrifugal switch, which cuts in the battery when the car speed approximates 10 miles an hour, also cuts it out immediately the car speed becomes higher than 35 miles an hour. The charging current from the generator is, therefore, maintained between the limits which have been ascertained by experiment to give the best all-round results.

The simplicity of the apparatus is carried even to the wiring which connects the motor-generator unit with the storage battery. For this purpose only two wires are used, and they lead to the battery. A third wire to the chassis for earthing purposes completes this portion of the installation. Despite the comparatively large size of the motor-generator, the total weight of the system, exclusive of the storage battery, is only about 50 lb. Inasmuch as a set of accumulators is generally carried for lighting purposes, the total net weight added by the motor-generator is nominal.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

MEXICO.—Information has been received at the B. of T. to the effect that a Bill has been submitted to Congress by the Ministry of Finance authorising the Government to revise the existing Customs Tariff of Mexico. The proposed measure authorises the Government to increase in the interests of national industries, the duties leviable on foreign articles similar in character to those produced in the country, such protection being limited to what may be indispensable to enable native to compete with foreign goods, due regard being paid to the interests of consumers. For similar reasons the duties on raw materials used in national industries are to be correspondingly reduced, provided that such materials produced in the country are not sufficient in quantity, or of sufficiently good quality, or can only be obtained at prices too high to be borne by the industries. It is also proposed to increase, to a reasonable extent, the duties on articles which are not of prime necessity, and which are at present dutiable at a low rate in the Tariff. The Bill also contains certain further provisions, including a proposal to increase the duties on goods imported through the Parcel Post.

It was anticipated that the Bill would be passed by Congress in a few days, and that the new duties would probably be promulgated and enforced by the Government within a comparatively short time.

URUGUAY.—A new law designed to accord privileges in favour of national industries has recently been passed. Under this law the Government is allowed to provide exemption from Customs duty for a period of 10 years for machines, apparatus, spare parts, accessories and material for the first installation of new factories established in the Republic; and to extend a like privilege, during the same period, to factories already existing, in connection with the renovation or improvement of their machinery. Exemptions from duty already conceded in virtue of special Laws remain in force. "Drawback" and "temporary admission" privileges may be conceded by the Government is respect of all articles imported from foreign countries and re-exported in any form. Imported goods which are free of Customs duty in virtue of this law are not to be subject to the surtax of 5 per cent. of the official valuations imposed in 1899; but they are to be subject to the surtaxes of 3 per cent. for port works, ½ per cent. for Consular service and 1½ per mil. in respect of merchant's licence.

Poulsen Radiotelegraphy.—In a letter addressed to our American contemporary, *Science*, Mr. Robert Anderson draws attention to recent achievements of the Poulsen system of wireless telegraphy, in which undamped continuous waves produced by an arc are employed. He states that "Stations ranging in power from 5 to 30 KW. are in operation in the large cities on the Pacific Coast, from Seattle to San Diego, and at Phœnix, El Paso, Fort Worth Kansas City and Chicago. Telegraphic messages are being transmitted constantly, day and night, along the Pacific Coast and as far east as El Paso, and messages are sent from there by night to and from the comparatively low-power stations so far installed at Fort Worth, Kansas City and Chicago. Since the recent establishment of a 30-KW. station at San Francisco, with two 440-ft. towers, it has been found possible to send messages direct from the coast to Fort Worth and Kansas City, and do away with the intermediate relays. Within the past few weeks a station has been completed at Honolulu, and every day from 1,000 to 4,000 words of news and private messages are sent thither by the San Francisco station. . . . This distance is more than 2,350 miles, and is the longest over which continuously successful wireless communication has ever been established. Furthermore, it is the longest single span of ocean necessary to cross in circling the globe, and forecasts trans-Pacific wireless communication in the near future. The power used at these Pacific coast stations is only a small fraction of that necessary for sending messages by the spark system across the 2,000 miles of ocean from Ireland to Nova Scotia.

"With the aid of mechanical transmitters and receivers, from 100 to 300 words per minute are accurately sent and received by the Poulsen system over distances of several hundred miles, and a method has been devised whereby two messages can be sent or two received simultaneously over the same antenna. The wave-lengths can be readily varied, and, as each station has its assigned wave-length to which it keeps its receiving apparatus attuned, messages can be sent to any point desired without troubling other stations. Or, if desired, all stations within range can receive the same message simultaneously. Messages sent by the Poulsen system are not read by the operators of other systems and the stations do not experience the interference from outside operators which is so troublesome a feature of the spark stations.

"In addition to telegraphic communication the Poulsen system has been proved successful for wireless telephony. I can personally attest the simplicity and clearness of this method of transmitting speech, having telephoned more than two years ago between Stockton and San Francisco, a distance of 80 miles over land. Subsequently speech has been carried in this way from San Francisco to Los Angeles, 450 miles, but as yet no thorough tests have been made of the system's telephonic possibilities, attention having been concentrated upon the telegraph."

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

27,664. "Dynamo-electric machines." Brolt, Ltd., B. Brooks and W. Holt. (Addition to 26,880, 1910.) December 2nd.

27,738. "Electric insulators." A. R. Muller. December 2nd.

27,758. "Regulating mechanism for electric distribution systems." British Thomson-Houston Co., Ltd., E. Garton and A. H. St. C. Watson. December 2nd.

27,765. "Electric lamps or torches. F. J. Turquand. December 2nd.

27,775. "Spring mounted footstep bearing for electricity meters." Korting and Mathiesen Akt. Ges. (Convention date, March 15th, 1912, Germany.) December 3rd. (Complete.)

27,780. "Thermostats for controlling electric circuits." A. W. Prim and F. W. Roper. December 3rd.

27,781. "Electric arc lamps." A. H. Railing and A. E. Angold. December 3rd.

27,783. "Electric lamps for automobiles." J. Gallay. December 3rd. (Complete.)

27,808. "Controlling switches for self-regulating dynamos." G. Inrig and G. Inrig, Ltd. December 3rd.

27,837. "Control of electric motors." F. E. Case. (Convention date, December 4th, 1911, United States.) December 3rd. (Complete.)

27,854. "Electrical switches." W. A. Knapton. December 3rd.

27,859. "Manufacture of tungsten." C. Gladitz. December 3rd.

27,874. "Electric switches." Siemens Bros. Dynamo Works, Ltd., and R. A. R. Bolton. December 3rd.

27,881. "Electric reduction of zinc ores." W. McA. Johnson. (Convention date, October 17th, 1912, United States.) December 3rd. (Complete.)

27,911. "Process and means for the production of electrotypes for letterpress printing." I. T. Nelson and J. Murray. December 4th.

27,922. "Electromagnetic lifting device." K. Miram. (Convention date, December 4th, 1911, Germany.) December 4th. (Complete.)

27,923. "Electric machines." Soc. S.T.A.R. (Systeme de Traction Auto-Regulateur). (Convention date, December 4th, 1911, France.) December 4th. (Complete.)

27,924. "Apparatus for the heating of liquids by means of electric resistances or gas." L. J. Simon. December 4th.

27,934. "Method for directing wireless radiations and means therefor." G. E. Heyl and T. T. Baker. December 4th.

27,956. "Starting devices for mercury vapour, electrometers, and the like." G. W. Johnson. (W. C. Heraeus, G.m.b.H., Germany.) December 4th.

27,961. "Devices for the automatic regulation of electric machines." R. Bosch (firm of). (Convention date, November 15th, 1912. Germany.) December 4th. (Complete.)

27,968. "Art of electrical smelting." G. H. Benjamin. December 4th. (Complete.)

27,969. "Telephone receivers." J. Schiessler. (Divided application on 4,407, 1912. February 21st.) December 4th. (Complete.)

28,006. "Device for automatically reversing connections of electric motors and like vehicles." C. H. Spencer. December 5th.

28,015. "Apparatus or appliances for use in connection with the electrodeposition of metals. A. Round and F. Fisher. (Addition to 15,492, 1912.) December 5th.

28,042. "System of duplex wireless telegraphy." S. D. Williams. December 5th.

28,046. "Electrically-heated cooking apparatus." A. F. Berry. December 5th.

28,061. "Electrical potential regulators." M. Fuss. (Addition to 7,220/11. Convention date, December 6th, 1911, Germany.) December 5th. (Complete.)

28,070. "Circuit arrangements for the reception of signals transmitted by means of electromagnetic waves." O. Imbay. (Compagnie Generale Radiotelegraphique, France.) December 5th. (Complete.)

28,071. "Method of charging condensers in parallel and discharging them in series." O. Imbay. (Compagnie Generale Radiotelegraphique, France.) December 5th. (Complete.)

28,086. "Electric storage batteries." G. O. Davies. December 5th.

28,094. "Joint boxes for electrical cables." W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. December 5th. (Complete.)

28,100. "Trackway for electric telphers." S. Cutler, jun. December 5th.

28,118. "Electrical horns or like sounding devices." F. L. Hollister. December 5th.

28,122. "Electric arc lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) December 5th.

28,140. "Electric signalling system and appliances to be used therewith." Verity's, Ltd., and H. Green. December 6th.

28,152. "Electromagnets." E. C. Villiers. December 6th.

28,159. "Electric welding." W. A. E. Crombie. December 6th.

28,189. "Electro-medical physical developers and the like." R. Fox. December 6th.

28,222. "Starting device for induction motors." Phœnix Dynamo Manufacturing Co., Ltd., and R. Pohl. December 6th.

28,227. "Electrical measuring instruments." British Thomson-Houston Co., Ltd., and F. Holden. December 6th.

28,229. "Electric lighting systems." Soc. Internationale de Lumiere Froide (Procedes Dussaud). (Addition to 8,087, 1912. Convention date, December 8th, 1911, France.) December 6th. (Complete.)

28,284. "Electrical adaptor." S. R. Lloyd. December 7th.

28,300. "Electric lighting systems of railway carriages and other vehicles." Variable Speed Gear, Ltd., and J. Robson. December 7th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

Refractory Metallic Bodies and their Manufacture. W. D. Coolidge. 18,467. August 15th. (August 15th, 1910.)

Electric Lighting Equipments for Personal Wear. H. H. Hirsch. 20,565. September 16th.

Electric Lighting of Vehicles. Compagnie Internationale d'Electricite Soc. Anon. 25,331. November 14th. (February 1st, 1911. Patent of Addition not granted.)

Electric Torsion Dynamometers. F. Lux. 25,337. November 14th.

Insulation of Electrical Coils or the Like. Pollak. (Specialfabrik fur Aluminium-Spulen und Leitungen Ges. m.b.H. 25,672. November 17th. (Convention date not granted.)

Electric Light Fittings for Attachment to Musical Instruments and Music Holders. P. R. J. Willis. (J. G. Mackenzie.) 25,756. November 18th.

Safety Devices for Electrical Installations. W. Dierman. 25,776. November 18th. (August 22nd, 1911.)

Apparatus for Measuring, Indicating and Determining the Charges incurred by a Consumer of Electrical Energy. E. T. R. Murray. 26,426. November 25th.

Starting Apparatus of Internal-combustion Engines. N. A. Christensen. 26,619. November 28th.

Control of Electric Motor-Generator Sets. British Thomson-Houston Co. and E. I. David. 26,863. November 30th.

Electrodes for Arc Lamps. British Thomson-Houston Co. (General Electric Co.) 27,620. December 8th.

Dynamo Electric Machines for Use in Electric Generative Systems of Motor Vehicles and the Like. B. Brooks and W. Holt. 28,137. December 14th. (Cognate application No. 13,396 of 1912.)

1912.

Sparking Plugs. G. Farina. 14,251. June 18th.

Electric Radiators. V. C. J. Nightingall. 16,506. July 15th. (March 19th, 1912.)

Arc Projectors. Korting & Mathiesen Akt.-Ges. 16,937. July 20th. (December 27th, 1911.)

Automatic Electric Shock Machine. L. Bauer and A. Ficker. 17,152. July 23rd.

Wireless Telegraph Transmitters. A. Shaw. 18,111. August 6th.

Arc Lamps. L. Kamm. 23,155. October 10th. (Divided application on No. 24,333, 1911. November 2nd.)

Joint for the Metallic Coverings of Insulated Electric Wires. F. J. Whiting. 31. January 1st.

Incandescent Electric Lamps. T. W. Lowden. 1,180. January 15th.

Electric Power Transmission Apparatus. Macfarlane Engineering Co. and W. A. Macfarlane. 2,817. February 3rd.

Hygienic Attachment or Cover for Telephone Mouthpieces. F. M. Stanton. 2,992. February 5th.

Pyrophorous Metal Alloys. Elektrochemische Werke Ges. 3,350. February 9th. (March 28th, 1911.)

Electric Couplings or Connectors. J. Wilkie. 3,772. February 15th. (July 9th, 1912.)

Electric Searchlights. Geb. Siemens & Co. 3,812. February 15th. (April 29th, 1911.)

Arc Lamps for Optical Lanterns. F. W. Branson. 4,431. February 22nd.

Intercommunication Telephone Systems. H. G. White and I. H. Parsons. 5,035. February 29th.

Brush-holders for Magneto Machines for Electric Ignition. A. G. Bloxham. (Robert Bosch, Firm of). 5,446. March 4th.

Apparatus for the Electro-deposition of Iron. G. Tischenko. 5,864. March 8th.

Carbon Electrode for Electric Furnaces. Planiawerke Akt.-Ges. fur Kohlenfabrikation. 14,267. June 18th. (July 21st, 1911.)

Electrical Contact Plugs for Switchboards or the Like, and the Method of Producing the Same. M. B. Richter. 16,144. July 10th. (July 10th, 1911.)

Illuminated Indicating Device or Sign. R. H. Hutchison and Fred. Wilkins and Brother, Ltd. 161. January 2nd.

Electric Fuses. C. H. Wordingham and E. R. Grote. 1,389. January 17th.

Methods of Neutralising Electric Charges formed on Textiles, Fibres, Paper and like Materials during the Working Processes. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 1,555. January 19th.

Electric Arc Lamps. E. E. Prestwich. 1,980. January 24th.

Means for Governing the Speed of Alternating-Current Commutator Machines. H. C. E. Jacoby. 3,007. February 6th. (Addition to No. 23,619 of 1909.)

Dynamo-electric Machines of the Homopolar Type. British Thomson-Houston Co. (Noeggerath.) 4,186. February 19th.

Switch-locking Arrangements on Switchboards used in Connection with Electrical Installations on Motor-cars and like Vehicles. C. A. Vandervell and A. H. Midgley. 4,682. February 24th.

Electrically-operated Means or Devices for Exhibiting Advertisements, Pictures, Notices or the Like. H. F. Joel. 4,974. February 28th.

Telephone Metering Systems. A. J. Boult. (International Telechronometer Co.) 5,972. March 9th.

Remote-controlled Electric Switches. H. G. C. Fairweather. (Hart Manufacturing Co.) 10,838. May 7th.

Means for Attaching Electric Wires and Cables to Insulators. T. Taylor. 15,324. July 1st.

Circuit Connections for Alternating-current Commutator Motors. Siemens Schuckertwerke G.m.b.H. 16,790. July 18th. (July 18th, 1911.)

Process and Apparatus for the Supply of Mica Flakes to Machines for making Composite Mica Plates. M. Meirowsky and Meirowsky & Co. Akt.-Ges. 17,332. July 25th.

Automatic Sectionalising Devices for Electric Distributing Systems. L. A. Hawkins. 21,264. September 18th. (September 11th, 1911.)

Method of Preventing Cathodic Reduction. A. Pietzsch and G. Adolph. 22,028. September 7th. (October 7th, 1911.)

New York's 30 Years of Electric Supply.—*The Electrical Review and Western Electrician* recently recalled the fact that September 4th last was the thirtieth anniversary of the beginning of commercial incandescent electric lighting, for in 1882 Mr. Edison commenced in New York his first central station, with a single 125-H.P. generator, which supplied some 400 lamps in an area of less than a square mile, through underground cables. Thirty years of commercial growth has seen the system of the Edison Co. become one of 1,300 miles of cable (360 being H.T. transmission cables), while the incandescent lamps in use now number 5,245,000, the connected load equalling 714,000 H.P. The system now covers an area of about 60 square miles in Manhattan and Bronx, supplied from the Waterside stations built in 1900 and 1905, and forms an interesting comparison with the original Edison plan, calling for 36 independent L.T. steam stations. So far as figures are available, it appears that the connected load for lighting and power (exclusive of traction) in the London area is something like 600,000 H.P. The recent return relating to London's electricity supply for the year 1910-11 shows that the total number of units sold for municipalities and companies (excluding traction supply) was 231,169,302, and that the capacity of the generating plant was 228,000 KW.